7 Great Dust Collection Accessories to Clear the Air

Our Favorite Shop Tips for Accurate Layouts

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Vol. 30 / No. 180

SPECIAL STORAGE ISSUE

MEDIA CENTER

- Knock-Down Modular Design
- Maximum Storage
- Built-In Lighting

ALSO!

A Finish that Will Stand Up to Anything

Add Detail to Your Projects with Simple Tricks

A Table Saw Technique that Every Woodworker Should Know

A Publication of August Home Publishing

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Hanging Wall Shelves 16

These easy-to-build shelves attach directly to a wall, freeing up floor space and allowing you to mix and match to fill your needs. Plus, they can be modified to create a handy wine rack.

designer series project

Snack Tray Cabinet 20

Practicality in disguise is the best way to describe this attractive cabinet. The traditional styling is perfect for any decor, while the handy snack trays it holds make it an "everyday user."

heirloom project Woodsmith GO ONLINE EXTRAS

Flat-Screen Media Center 30

Look past the "wow" factor of this impressive project and you find what might be the last media center you'll ever need. A classic look, bundles of storage, and all the great woodworking you could ask for.

Media Center page 30

editor's note
Sawdust

As you can see on the cover, this issue of *Woodsmith* is dedicated to storage. Now, I know most of us could use additional storage around our homes. And I think all three projects you'll find inside do a good job of addressing this need.

Our feature project in this issue is a media center. It's a modular design, so whether you build the whole project or just the base cabinet, it's the perfect place for a large, flat-screen TV and all the electronic gadgets that go along with it.

One of the other projects in this issue looks like a small, straightforward cabinet from the outside. But pull open any of the four lower "drawers" and you'll discover a folding snack tray that's a perfect place for setting your favorite snack and beverage while watching a movie or a football game.

Lastly, if you're searching for a simple weekend project, take a look at the hanging wall shelves. They're easy to build and use a clever mounting system that's strong but totally hidden from view. You can read more about it on page 16.

Terry

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4. Other classes mailed through the USPS	0	0
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The symbol above lets you know there's more information online at www.Woodsmith.com. There you'll see step-by-step videos, technique and project animation, bonus cutting diagrams, and a lot more.

Tips & Techniques

Spline Thicknessing Jig

I like to use hardwood splines to reinforce miter joints. But cutting the splines to the exact thickness of the groove can be tricky. So I cut them a little thicker than needed and use the jig you see above to fine-tune their fit. The jig holds the spline in place while I trim it with my block plane.

The photo above shows how it works. The plane runs in a track on top of the jig.

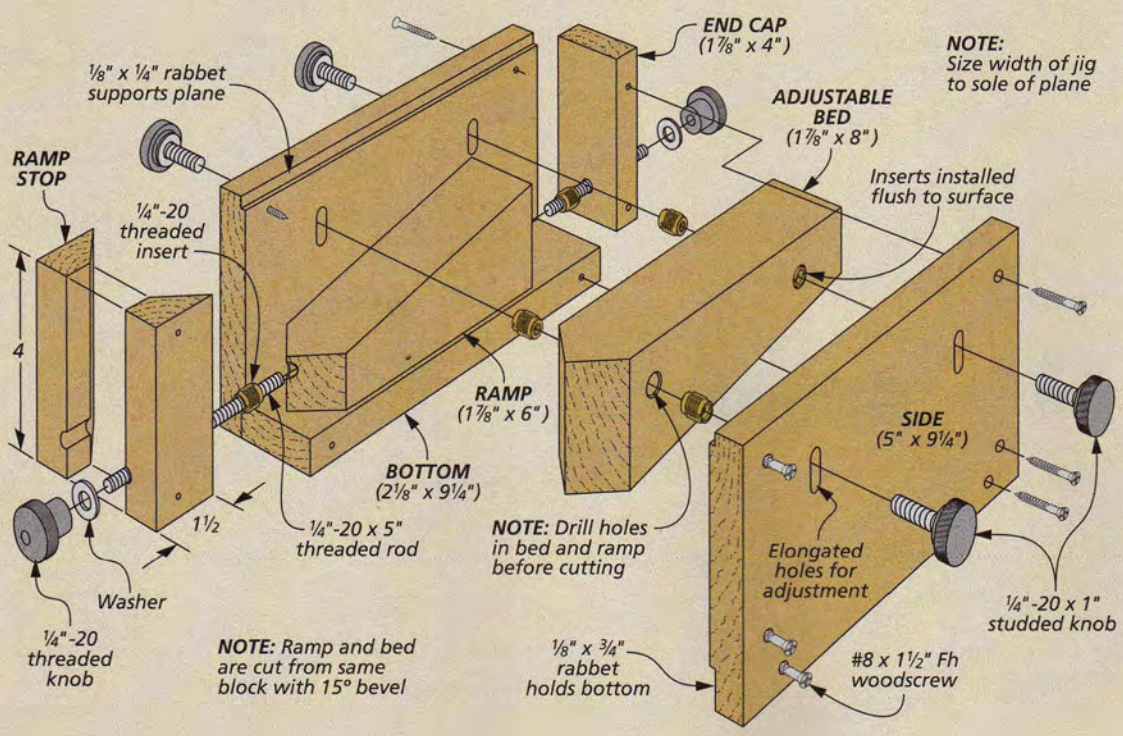
The jig is built around two opposable ramps. The bottom ramp moves forward and backward on two threaded rods that attach to the ramp through the ends.

A knob at the front and back allows you to fine-tune the jig, raising and lowering the adjustable bed as needed (inset photo). The two knobs on each side of the jig lock the bed in place as you trim the spline with the plane.

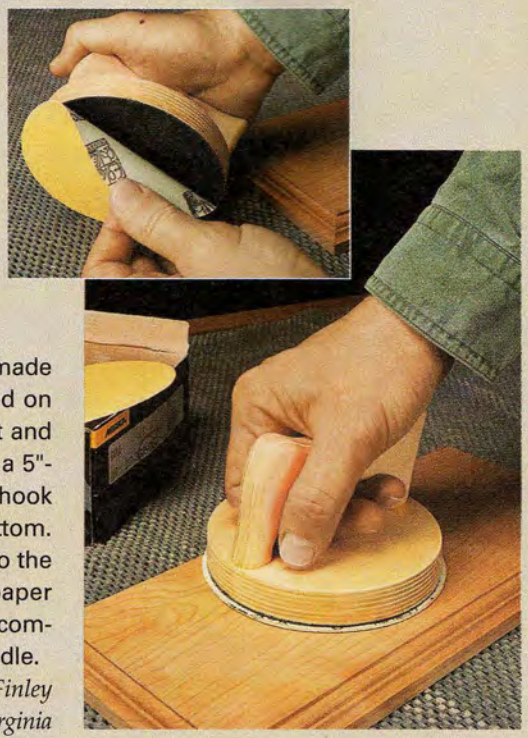
To adjust the height of the bed, loosen the side thumbscrews. Then use the front and rear adjustment knobs to move the ramp in the bottom of the jig forward and backward (main drawing).

Now with this jig, fine-tuning a spline to fit a groove is a safe, easy, and accurate task.

Douglas Perlick
Buffalo, Minnesota



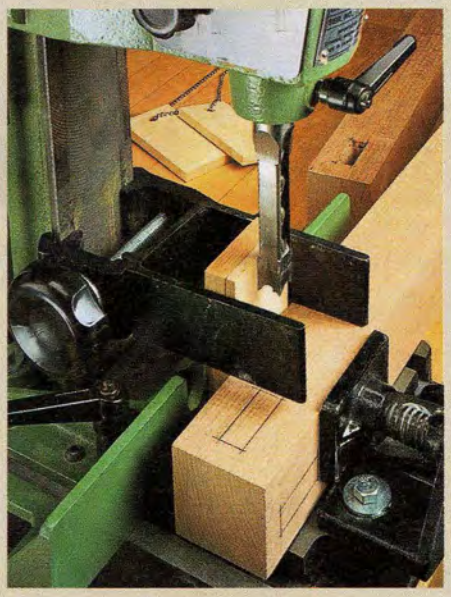
Round Sanding Block



Orbital sanders are a great addition to the shop. But buying both disk sandpaper for the sander and sheet sandpaper for a sanding block is expensive.

I solved the problem by creating this sanding block that accepts hook and loop disk sandpaper. It's made from a few scraps of plywood I had on hand in the shop. The handle is cut and shaped to fit my hand. The base is a 5"-dia. disk of plywood with a piece of hook and loop material glued to the bottom. The sandpaper disks attach easily to the sanding disk. And I can change paper quickly. An added benefit is more comfortable sanding with a shaped handle.

Ronnie Finley
Dunlow, West Virginia



Mortiser Set-Up Shims

Squaring the chisel and adjusting the fence on my mortising machine was tricky and not always accurate. So I cut a few shims to help with this task.

The shims are planed to different thicknesses. I just select the shim that matches the distance between the edge of the workpiece and the edge of the mortise. With the shim between the fence and chisel, I adjust the fence until the shim is snug against the chisel. This squares the chisel and sets the fence in one step.

You don't need to have a shim for every distance, as these shims can easily be stacked to create greater distances.

Ivan Torkelson
Elgin, Iowa

SUBMIT YOUR TIPS ONLINE

If you have an original shop tip, we would like to hear from you and consider publishing your tip in one or more of our publications. Go to:

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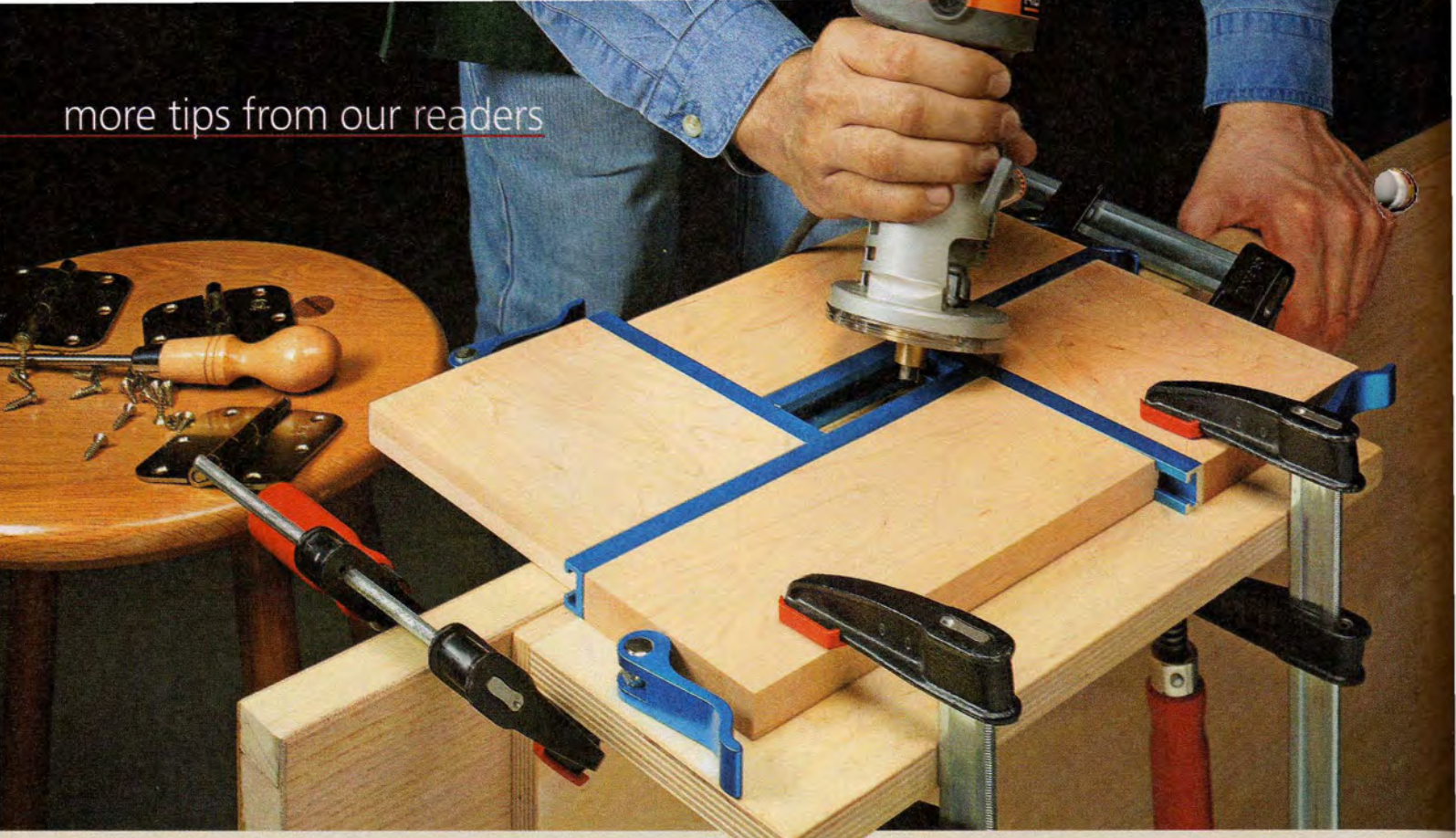


Jig for Routing Hinge Mortises

Making a template each time I needed to rout a mortise for a hinge was time-consuming and not always accurate.

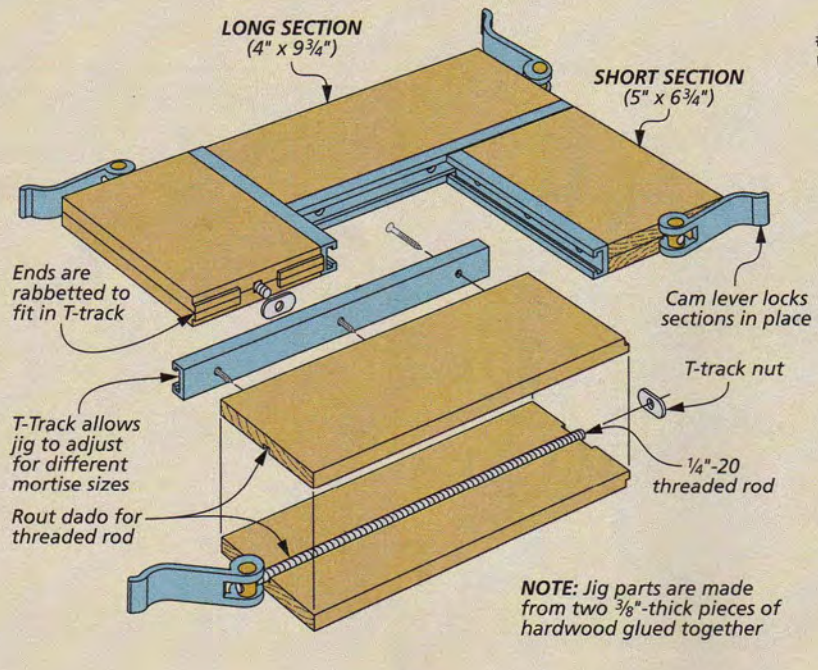
This mortising jig was a quick build and it adjusts to accommodate hinges up to 3¼" x 6".

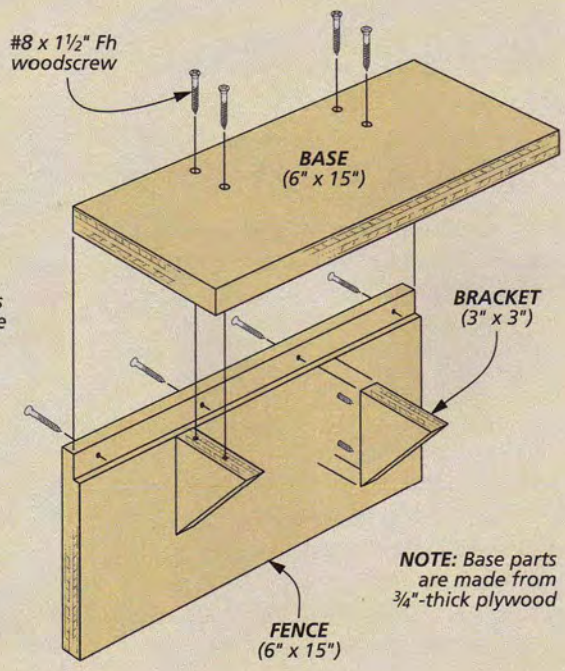
The jig is built from eight pieces of ⅜"-inch hardwood. The center of each piece has a ⅛" dado cut in it to hold the threaded rod. After the pieces are glued into sections, rabbets are cut on one short end of the section and T-track is attach to one long side.

The sections of the jig are connected with T-track, threaded rod and flange nuts (drawing below). They lock in position securely with cam levers.

I clamp a fence (right drawing) to the workpiece and the jig. Then install a guide bushing and straight bit in your router and you're ready to cut hinge mortises.

Sandy Goldstein
Reno, Nevada



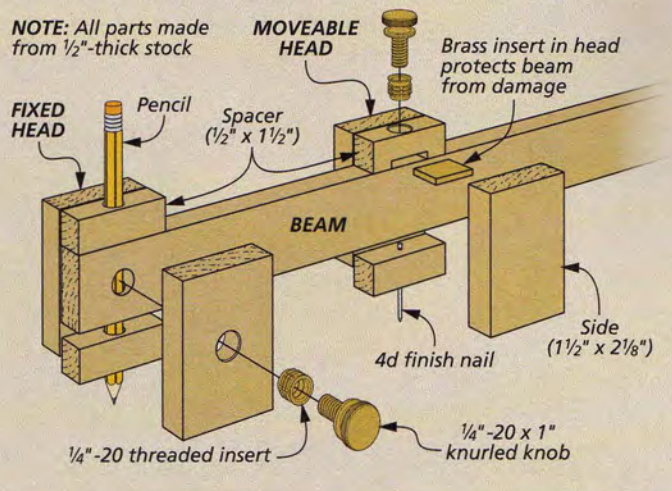


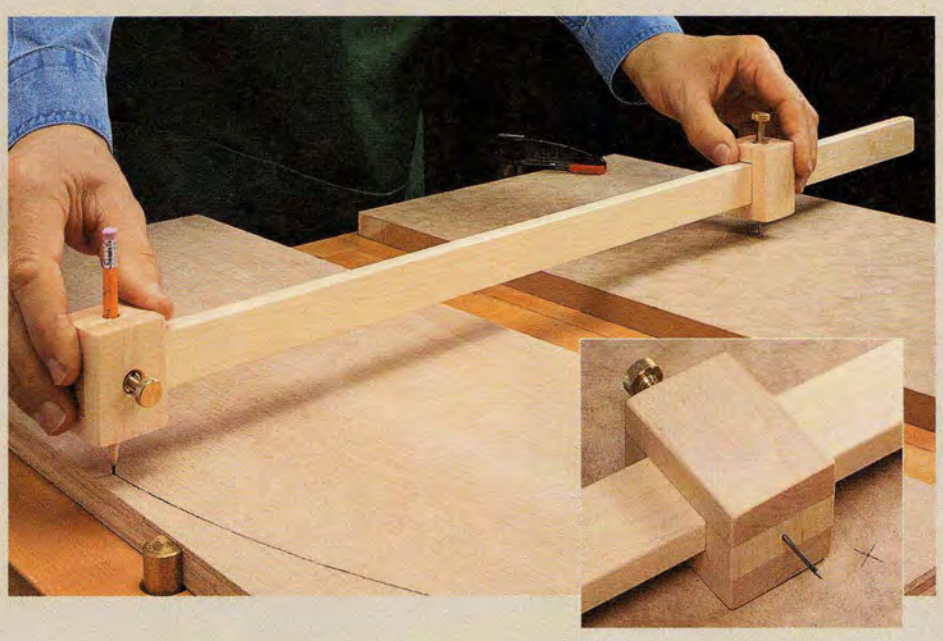
Beam Compass

I needed to lay out a curve on a set of cutting boards I was making recently. I tried the old "string on a pencil" trick, but I just wasn't getting the results I wanted. So I looked around my shop for materials to build a beam compass.

I used a long straight piece of hardwood for the beam. Then it was just a matter of laminating a few small pieces of hardwood to make the heads to hold the pencil and point. I added a small piece of brass between the knob that locks the sliding point (a finish nail) to the beam and protects it from wear. The pencil is held with a second knob in a fixed head.

David Dietz
Enumclaw, Washington





Win This Bosch *Impactor* Driver

That's right, send us your favorite shop tips. If your tip or technique is selected as the featured reader's tip, you'll win a *Bosch* impact driver just like the one shown here. To submit your tip or technique, just go online to *www.woodsmith.com* and click on the link, "SUBMIT A TIP." You can submit your tip and upload your photos for consideration.

The Winner!

Congratulations to Douglas Perlick, winner of the *Bosch Impactor* driver. To find out how you could win a *Bosch* driver, check out the information on the left.

Quick Tips

TEMPLATES ON SELF-ADHESIVE LABELS

A couple common ways to transfer a cutting pattern to a workpiece are to trace the pattern with carbon paper or use spray adhesive to attach it. But I found a more convenient way, using adhesive mailing labels printed on the copy machine or computer printer.

The labels come in a variety of sizes, up to 17" x 22". They are also available in standard paper sizes. All you need to do is peel and stick the template to the workpiece and start cutting your pattern.

Charles Mak
Calgary, Alberta

MASKING TAPE STORY POLE

I like to mark part lengths and make other notes on my saw table as I cut parts. But after ruining some parts by confusing the mess of pencil lines from many projects, I decided to clean things up.

Now I stick a wide piece of masking tape on the saw table next to the fence for making notes. When the project is done, the tape can be replaced for the next project.

Chris Fitch
Winterset, Iowa

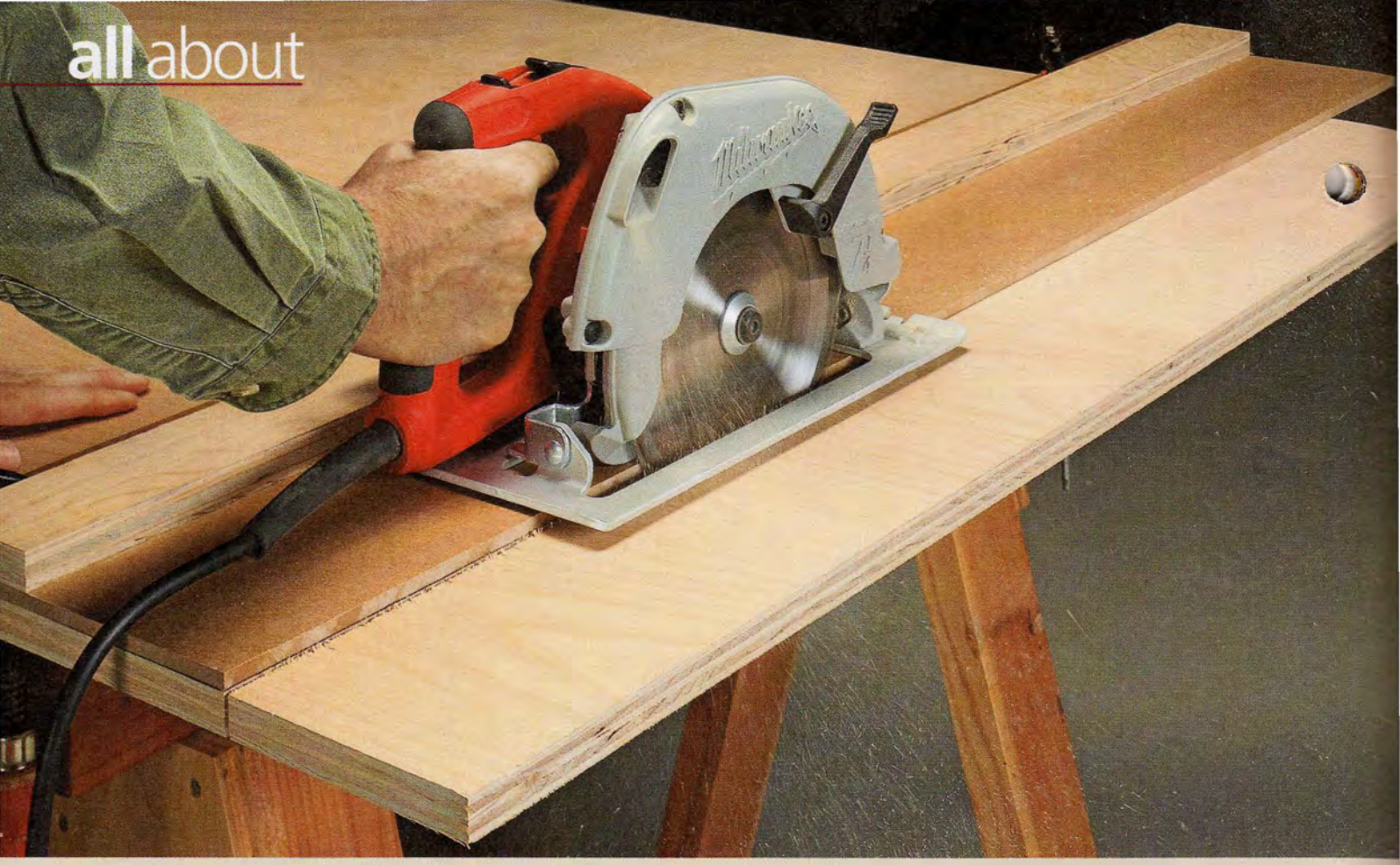
SPLINTER-FREE PLYWOOD CUTS

I've noticed that the face veneer on hardwood plywood just keeps getting thinner all the time. Because it's so thin, it splinters quite easily. Taping the veneer at the cutting line works to a degree, but I still had too much splintering.

I found that dampening the veneer with isopropyl alcohol softens it enough to minimize splintering on the cut edge. The alcohol is a better choice than water because it doesn't raise the grain and it evaporates more quickly.

Now I keep a spray bottle of it in my shop all the time to moisten plywood veneer.

Henry Tong
Riverside, California



cabinet-grade Plywood

A wide variety of core types and veneer faces let you choose the right plywood for your projects.

▼ Different core types determine plywood uses.

Plywood is a good choice for many woodworking projects because of its stability and flat faces. The media center in this issue is a good example. But selecting the right type of plywood can be a challenge.

Plywood is available in a variety of native hardwood veneers. So matching hardwood and plywood for a project is easy. But there's more to choosing plywood than matching the veneer to a species of hardwood. The materials used in the core can make a difference in the way your project is constructed, as you'll see.

CORE CONSTRUCTION

Just as there are multiple types of veneers, the core of plywood can be constructed from a variety of materials. Core construction can be solid wood or composite wood. But before you buy plywood for your next project, it's helpful to know a little bit about the types available.

VENEER CORE. One of the most common core construction materials is just layers of veneer. The core is solid wood veneers of three to seven plies, laid in alternating directions, all less than ⅛" thick. Although this is the most expensive plywood available, it's my first choice for furniture constructon. The veneers are bonded with water-resistant adhesive. Plus, it's light, strong, and holds screws well.

MDF CORE. Plywood with medium-density fiberboard (MDF) as its core is the least expensive. MDF is just processed wood fibers mixed with resin and wax and pressed into panels. Plywood with this type of core usually mills

flat, straight and smooth. But there are a couple of drawbacks to MDF-core plywood. For one, it's about twice the weight of veneer core. And while it's great for projects that are glued together, it doesn't hold screws very well.

COMPOSITE CORE. A relatively recent development in plywood is a core that combines solid wood with engineered wood products. Typically, this consists of an inner core of solid wood veneers, sandwiched between two layers of either MDF or particleboard. The advantage is that you get the flatness, consistency, and stability of MDF-core plywood, along with the screw-holding ability of veneer-core plywood. The cost is usually comparable to veneer-core plywood.

FACE VENEERS

The veneer used on the surface of plywood is created in several ways. Depending on which way the log is cut at the mill, different patterns will appear on the face of the plywood. You can see what I mean if you take a look at the box below.

But the cut of the veneer is only one aspect. The thickness of the veneer should also be considered, as well as the grade.

THICKNESS. At one time, veneers were cut at least 1/16" thick. But with new technology veneers are much thinner now, some as thin as 1/125". With a thinner veneer, you'll have to protect the surface from damage during the building process. Veneers are cut thin to extend the supply of hardwood lumber. Plus thinner veneers keep the cost of plywood within reason.

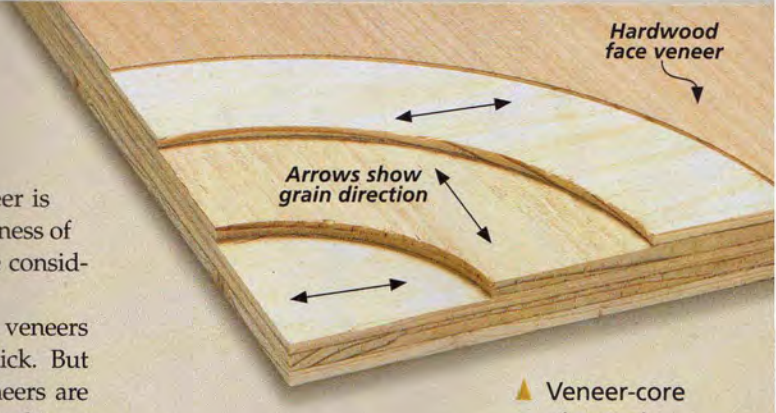
QUALITY. Hardwood plywood has its own system of grading, with one rating for the primary face of the plywood and another rating for the back face. Face ratings begin at A and go to D, although little low-rated plywood is sold.

Most plywood sold for furniture construction is rated A on the good face. This means the veneer has a consistent match on the grain with minimal or no blemishes.

A B-grade face is almost as good as an A-grade, but you might see a knot, burl or streak on the face veneer. These slight defects in the face must be very tiny or the grade quickly slips to a C, where imperfections can be as large as 1/2". There may also be rough grain patches or repaired splits on C-grade veneer.

The back side of the sheet of plywood is graded 1-3, with 1 being the highest quality. While grade 1 has no visible defects in the veneer, you won't see the grain and color match that you see on the face side. Grades 2 and 3 have more imperfections on the veneer, including rough grain and mineral streaks.

Choosing plywood to get your project off on the right foot is as unique as the project itself. And with a variety of materials to choose from, I think you'll find just what you need for great results.



▲ Veneer-core plywood alternates grain direction on each layer for extra strength.

How it's Done: Cutting Veneer for Plywood

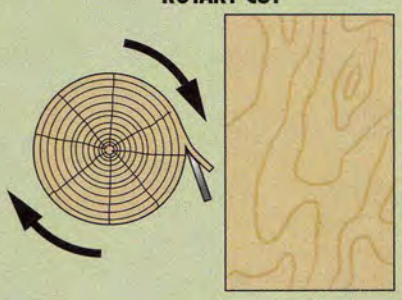
Veneer is sliced directly from the log at the plywood mill. The way the veneer is sliced from the log determines the surface pattern on each sheet of plywood.

ROTARY CUT. The most common way of cutting the log is with a rotary cutter (top left). In this type of cut, the log is laid against a knife and the veneer is peeled off the outer circumference of the log.

MATCHING GRAIN. Another way is to cut the veneer like boards from a log. This type of cut produces a cathedral grain (top right).

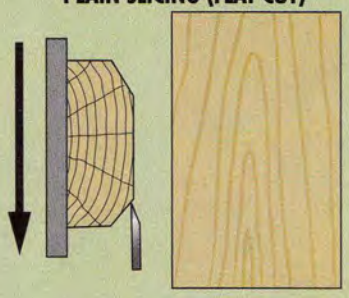
If the veneer is cut perpendicular to the growth rings, you'll see a grain like quartersawn lumber (bottom left). Riftsawn veneers are cut at an angle to the growth rings (bottom right).

ROTARY CUT



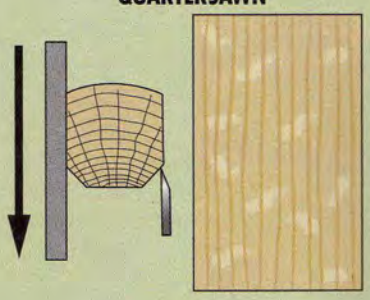
Rotary cut veneer is produced by rotating the entire log against a long knife

PLAIN SLICING (FLAT CUT)



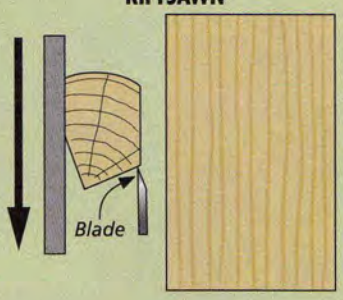
Slicing the log parallel to the center creates veneer with "cathedral" grain

QUARTERSAWN



Quartering the log before slicing it into veneer results in straight grain and "flecks" from the medulary rays

RIFTSAWN



Cutting the veneer at a slight angle will produce straight grain, but without the flecking

7 super accessories for Dust Collection

Take a look at a few, inexpensive add-ons guaranteed to help keep your shop cleaner.

In a shop filled with power machinery, efficient dust collection is more than just a convenience, it's pretty much a necessity. In short order, a planer, table saw, or router can create a small mountain of chips and cloud the air with unhealthy dust. Fortunately, for any dust collection challenge you might encounter, there's more than likely a fixture or accessory available that will handle it. Here is a sampling of some of our favorites. Source information is provided on page 51.

1 Loc-Line® System

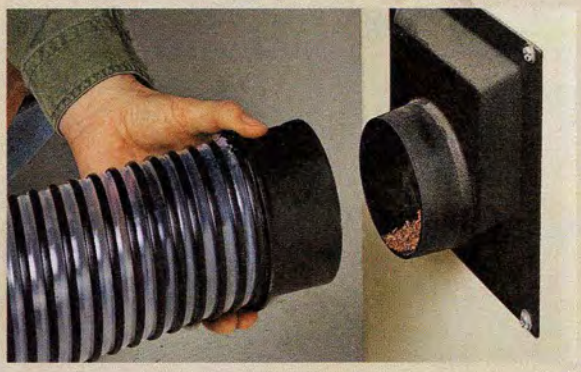
Although it may look like something from the imagination of Dr. Seuss, you'll find that the *Loc-Line* system is very practical. The heart of the system is a rigid, segmented hose that can be bent and shaped to position dust collection right where it's needed. A couple of snap-on nozzles are available, as well as adapters that let you attach the hose to a shop vacuum or dust collector. (Hose - $28, Fittings - $5 to $6)

2 Rockler Dust-Right®

The *Dust-Right Master System* turns your stationary dust collector into a powerful, dust-busting shop vacuum. Once the handle is clamped to a section of 4" hose, a variety of attachments makes shop cleanup a snap. The floor nozzle (at left) will put your broom out of work. The system includes a blast gate, wall hangers, and an adapter that allows you to "plug" the handle into a machine's dust port. ($70)

3 Remote Control Switch

To do its job, a dust collector has to be switched on. And if you have to walk across the shop to turn on the collector for what might amount to 30 seconds of work at a machine, it can be tempting to skip the trip. But when the dust collector is hooked up to a remote, the switch is always at your fingertips. And you'll never think twice about turning it on. ($70)

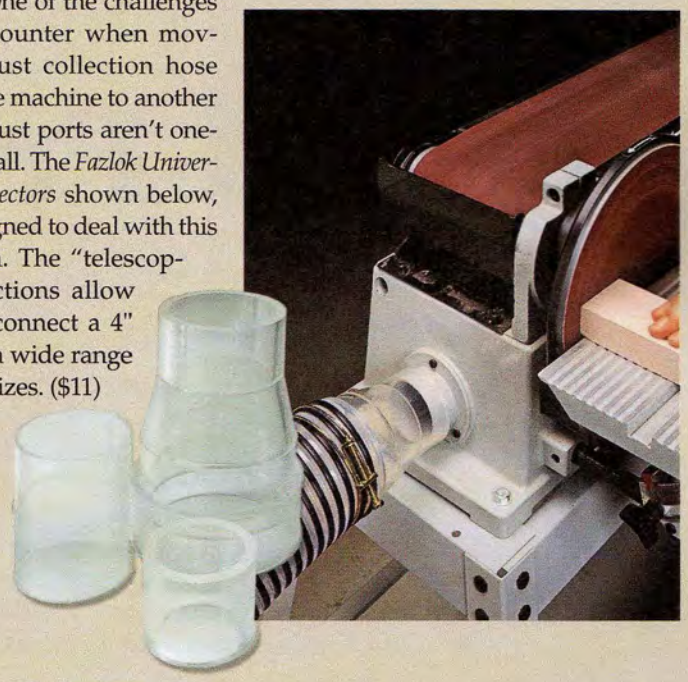


4 Cyclone Lid

When you use a shop vacuum for dust collection, capacity is an issue. A good solution is to turn your shop vacuum into a high-capacity, two-stage collector with a plastic trash can and a *Veritas Cyclone Lid.* The idea is to rout the chips and dust through the trash can where the "cyclonic" action created by the lid separates out most of the heavier debris. ($42 to $55)

5 Fazlok® Universal Connector

One of the challenges you encounter when moving a dust collection hose from one machine to another is that dust ports aren't one-size-fits-all. The *Fazlok Universal Connectors* shown below, are designed to deal with this problem. The "telescoping" sections allow you to connect a 4" hose to a wide range of port sizes. ($11)



6 Quick-Disconnect Fitting

If you don't enjoy the luxury of a permanent hose connection to each machine, you'll love this quick-disconnect fitting. It simply threads into a 4"-dia. hose and then allows easy slip-off, slip-on changeovers, as shown above. ($6)

7 Magnetic Dust Chute

What do you get by combining the strength of rare-earth magnets with a simple dust chute? As you can see in the photo at left, the answer is convenient and versatile dust collection.

The four rare-earth magnets on the bottom of the *Veritas* dust chute provide 40 lbs. of holding power. This allows you to securely position it on a spindle sander, drill press table, lathe, or any iron surface. The 2½" opening fits a standard shop vacuum hose. ($31) W

tips for

Perfect Project Parts

A successful project starts with accurately sized parts with matching color and grain. Here are a few tips for getting the best results.

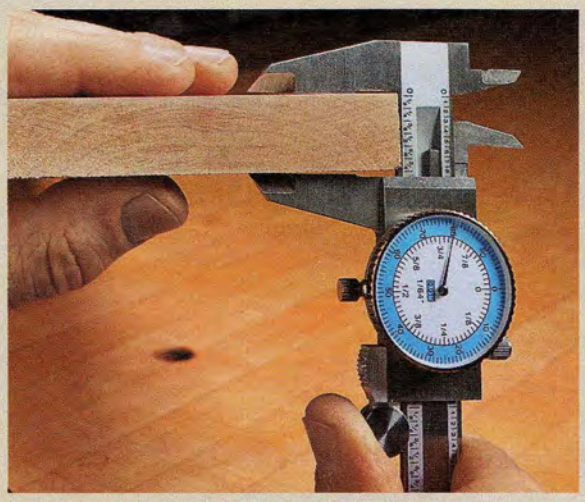
One of the best ways to measure your skills and progress as a woodworker is to look at the projects you made five or ten years ago and compare them to your most recent work. If you're anything like me, you may cringe a little at those old masterpieces. Some of the mistakes stick out like a sore thumb. And I can usually trace the problems to poor wood selection and grain consideration, or individual pieces that were cut and shaped "just a little bit off." Here are a few ideas to help eliminate some of these common mistakes in your future projects.

WOOD SELECTION. A quality project really starts at the lumberyard. By taking the time to sort through the stack of boards to find stock that's as straigth and flat as possible, you'll make it easier on yourself later. And it's a good idea to buy an extra 15-20% more stock than your plan calls for.

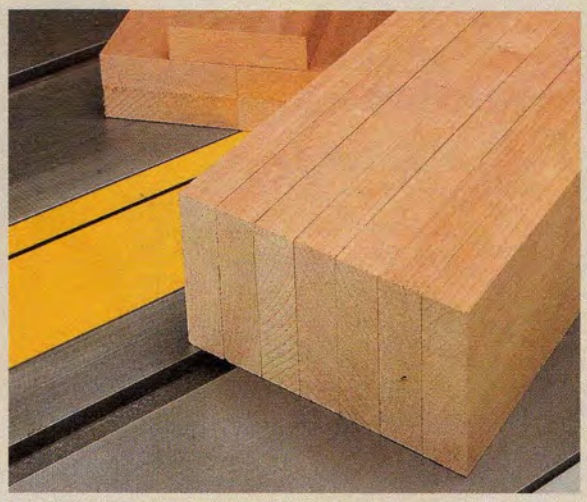
One reason to buy extra stock is to ensure a good color match for

▲ Square up the fence of the jointer, then joint and mark the flat, square sides of your workpieces.

▲ After flattening one face at the jointer, a planer will make the opposite face perfectly parallel. Then plane the board to final thickness.



▲ Dial calipers provide a level of accuracy that takes the uncertainty out of measuring the thickness of a freshly planed workpiece.



▲ The cast iron top of a table saw provides a handy reference surface to make a visual check on the squareness of project parts.

your project. You may not be able to match the color of the boards later if you run short and have to go back and buy more. Another advantage is you can mill the extra stock as you work and have a spare piece ready if you need it.

THE MILLING PROCESS. For success with any project, you'll need to begin with flat, square stock. But most lumber needs some work to get there. This is where a jointer comes in handy. Start by squaring one edge and face of each board and marking them, as shown in the lower left photo on the opposite page. Now you can plane the opposite face and rip the other edge to get flat, square stock.

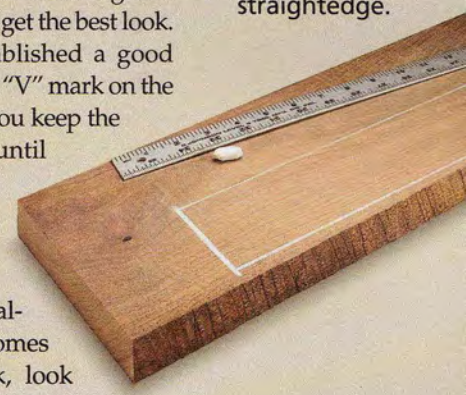
ROUGH OUT PROJECT PARTS. After squaring up the stock, you're ready to lay it out on your bench and start deciding how to use each piece. You can begin by evaluating it for color and grain characteristics (straight or cathedral) and then mark any knots or other defects.

I find it helpful to mark out the largest and most visible project parts first. This way, I can prioritize how I'll use the best boards. Shorter and less visible parts can be cut out of the rest of the stock. Use chalk and a straightedge to define the oversized shape of each part, as shown in the margin photo at right.

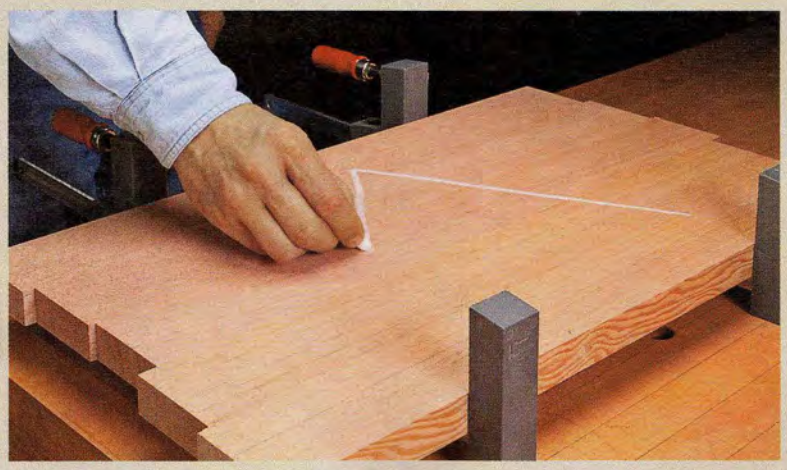
For tabletops or other large, glued-up panels arrange color and grain-matched boards to get the best look. Once you've established a good sequence, a simple "V" mark on the surface will help you keep the boards in order until you glue them together (photo below).

LEGS. Legs often pose a unique challenge. When it comes to choosing stock, look for riftsawn boards. As you can see in the photo at left, the diagonal grain gives a consistent look to all four faces.

▼ Rough out parts for grain direction and color using chalk and a straightedge.



▲ Riftsawn wood (left) makes for a more straight-grained leg grain than quartersawn.



▲ Once you've put together a good group of color and grain-matched workpieces, a simple chalk mark serves as an excellent reminder of the order for each piece during assembly.

FROM ROUGH TO FINAL

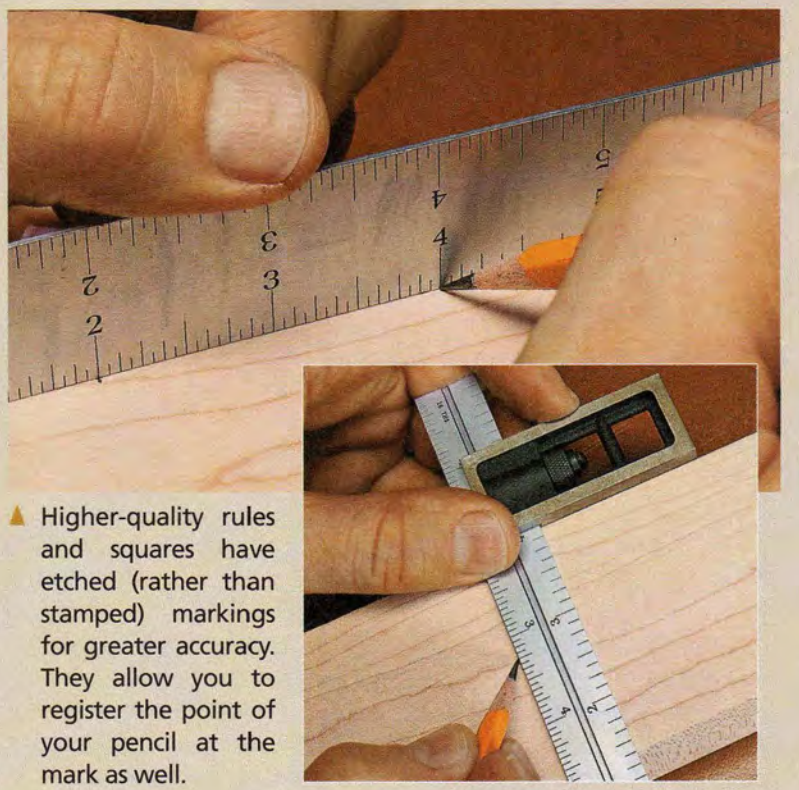
After you've finished milling your lumber and rough cutting a stack of parts, it's time to start turning those rough blanks into the components of your project. And that begins with cutting them to final size.

FENCES & STOPS. In a power tool workshop, there's not much need for marking the width and length of every workpiece. Instead, you can just set the rip fence on the table saw to cut the parts to width and a stop block for the length cuts. The photos below are good examples of these techniques.

KEEPING TRACK. It's still easy to make mistakes, however, even using this method. The problem isn't making your cuts accurately, but keeping track of which parts you've cut and which ones you still need. This is where following your cutting list can make a difference.

I find it helps to cut all like parts at the same time and stack them together, labeling each stack. This way, I can lay the parts on the bench and have a running count of where I am on the cutting tasks. The main photo on page 12 shows you what I'm talking about.

This is also a good time to use some of the extra stock to make a few spare parts. Having a spare piece cut to size can be a real time saver if you make a mistake or have a problem with tearout later while cutting the joinery for your project.

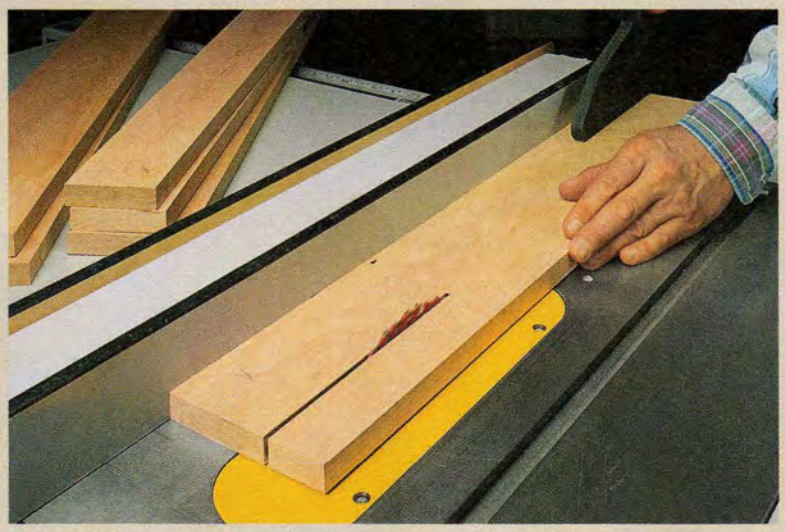


▲ Higher-quality rules and squares have etched (rather than stamped) markings for greater accuracy. They allow you to register the point of your pencil at the mark as well.

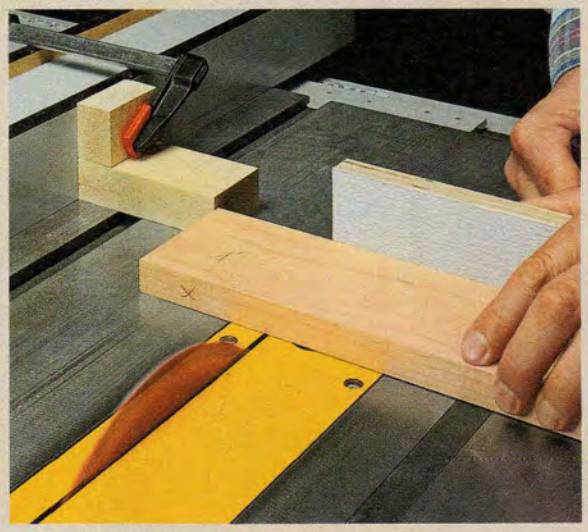
MEASURING AND MARKING JOINERY. Now that you have a stack of straight, square, and properly sized workpieces, you can turn your attention to laying out the joinery. Once again, using power tools to cut mortises, tenons, or dovetails may make it tempting to skip the layout and move right to the machinery.

But your work will benefit from laying out at least the first joint for each type of cut. This way, you'll have an easy visual reference to make sure the cuts are where they need to be. After you verify the accuracy of the layout, then you can rely on fences, stop blocks, and templates to repeat the cut.

THE RIGHT TOOLS. To make accurate layout marks, you'll need to use the right tools. That doesn't mean you need to spend a lot of money on them, but they need to be reliably accurate. Look for rules and squares that have etched markings, not stamped. They're easier to read and more accurate. The photo above shows one of the benefits.

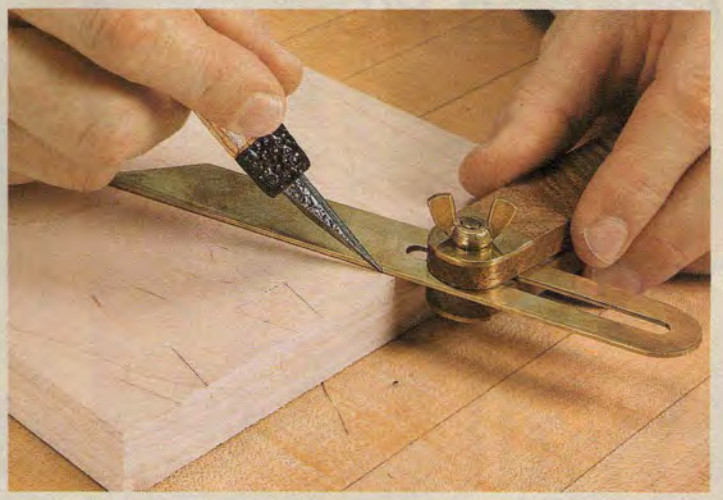


▲ Cutting all project parts of the same width at the same time avoids mistakes by allowing you to use the same fence setting for each piece. Going back later to reset the fence can result in deviations.



▲ A stop block eliminates the need to measure and mark each workpiece. By carefully setting the block location, you can be assured of identical parts.

▲ Using a marking gauge to lay out the location of a mortise makes it easier to set up a mortiser or cut it using a drill press and chisel.



▲ A sliding bevel gauge and a striking knife are the tools of choice for laying out dovetails. The bevel gauge provides a consistent angle and the knife makes a crisp cut line.

In addition to the standard tape measure and a sharp pencil, your basic set of tools should include a steel rule, a combination square, a marking gauge, and a sliding bevel. Adding a striking knife to your toolbox will be useful for joinery. A cut layout line provides an easy reference for placing the edge of a chisel to clean up the joint.

TECHNIQUES. The most important thing to remember when marking joinery is to start from a square reference edge and end and use those points throughout the process. Working from the same reference edges keeps the marks consistent.

MARK POSITION OF WORKPIECES. It's also a good idea to get in the habit of deciding the order and placement of parts in the final assembly. It's not necessary for every piece, but legs, for example, often require a decision about placement before cutting the mortises for aprons. A simple mark on the top, like LF or RF (left/right front), can save confusion and mistakes later.

In the case of drawers, marking the mating pieces can be essential for fine tuning a dovetail. The mark can also help you avoid cutting a groove for the drawer bottom on the wrong edge. Finally, you can check everything with a dry fit of the assembly (box below).

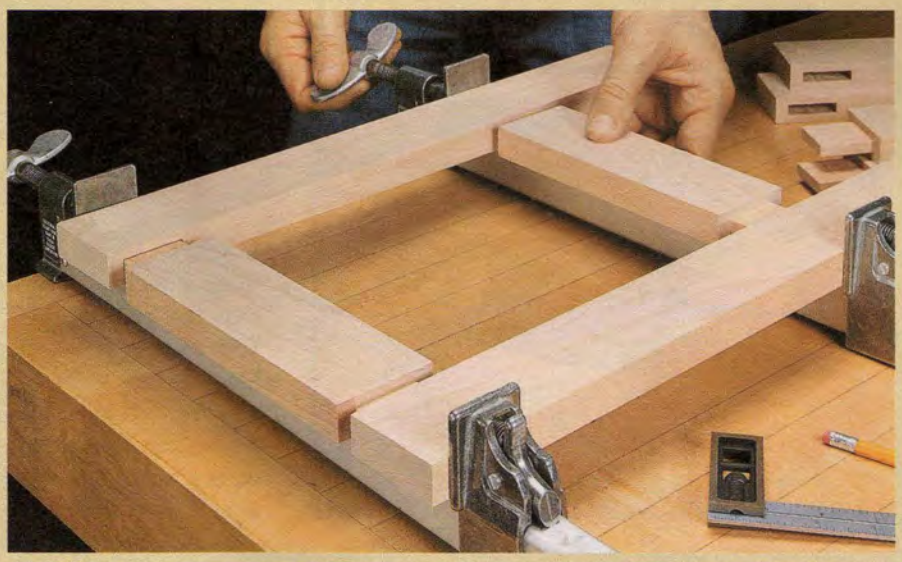
FINAL CUTS. By taking the time and effort to start with flat, square stock and then measuring and marking accurately you can approach the final cuts with confidence. Whether it's a mortise, tenon, dovetail, or just a square end cut, developing good habits for laying out your work is time well spent. W

How-To: Dry Fitting Assembly

No matter how carefully you choose the grain and color for your parts, and how meticulous you are when cutting the joinery, there's no guarantee the parts will work well together as a whole. That's why it's a good idea to test fit them before final assembly. A dry fit (where you put the parts together without adding glue to the joints) gives you the final opportunity to make any adjustments or replacements before it's too late.

The things to look for are a good fit at the joint lines and the color and grain of the overall assembly. Don't be afraid to change positions or even replace a part when necessary.

Another advantage of dry fitting your projects is that it gives you a chance to review the order of assembly and your clamping strategy. This way, you'll be able to have the clamps opened to the approximate length and also have the needed cauls or blocks handy.



Dry Fit. *At this stage, you can spot any problems with the overall assembly. Checking the fit of the joinery and the color and grain match while the parts are in position can reveal defects or mismatches that aren't apparent in the individual pieces.*

hanging Wall Shelves

The free-floating design allows you to group these shelves in versatile and complementary arrangements.

▲ Hanging the shelves is made easy with a two-piece bracket that includes a level. Just lower the shelf over the cleat for placement.

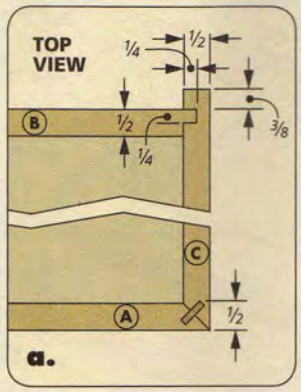
If you're looking for shelving that's attractive and space-saving, then this project will fit nicely in your home. The four-sided shelves hang securely to the wall with hidden brackets. Plus, the low-profile shelves can be grouped, so you can hang several together without taking up valuable floor space.

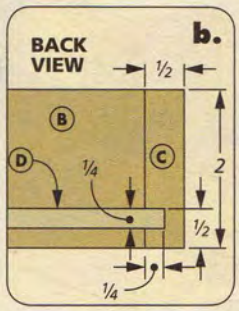
And the shelves are easily modified to store bottles of wine or wine glasses. With these shelves, just a few feet of wall space could be converted into a mini wine bar to serve you and your guests.

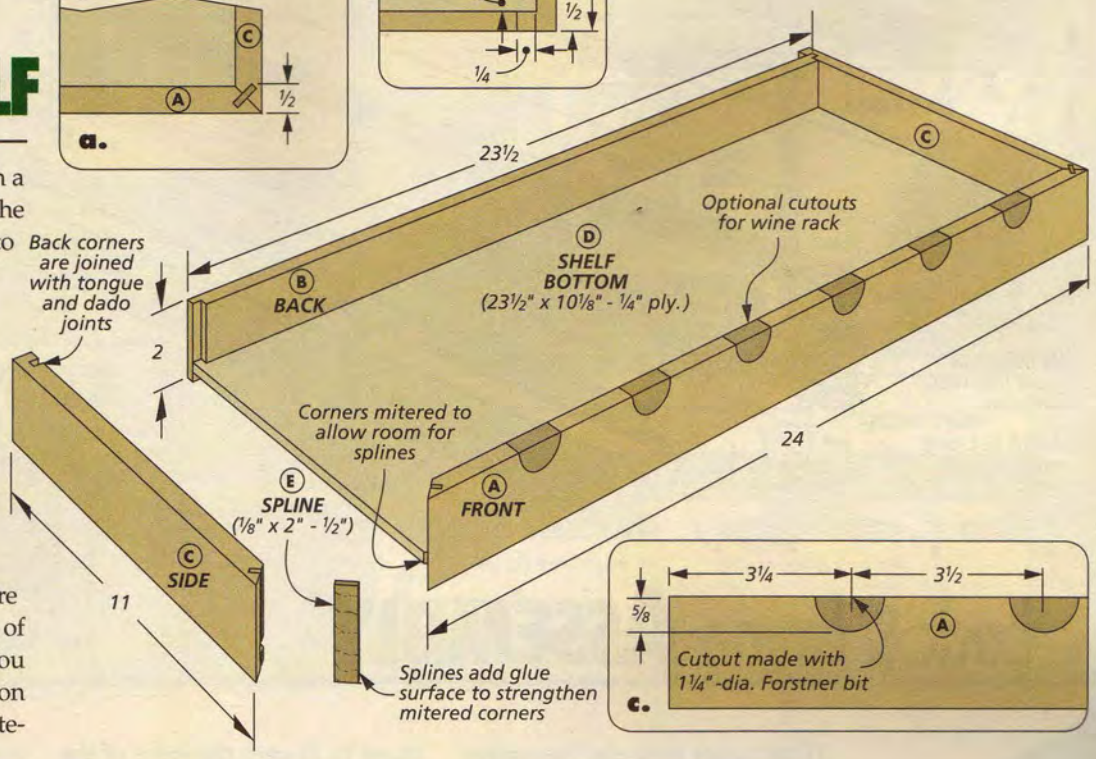
Although these shelves are pretty easy to build, there are enough woodworking techniques packed into them to keep you challenged. Splined miters join the front corners, while tongue and dado joints hold the back.

If the clean lines of these shelves don't suit your decor, then check out two additional styles for the shelves as shown on page 19.

building the BASIC SHELF







Each shelf is just four sides with a bottom panel held in a groove. The sides extend beyond the back to create a space for the hanging bracket that's added later.

SIDES. I started by ripping the front, back, and two sides of the box to width. Next, I cut the pieces to length, including the miters on the front corners. Then I cut the slots for the splines as shown in the box below.

SPLINES. The miter joints are strengthened by the addition of 1/8"-thick cross-grain splines. You can find more information on making the splines in Shop Notebook on page 28.

DADOES AND GROOVES. The back is joined to the sides with a tongue and dado joint as shown in detail 'a.' I started by cutting the dadoes in the sides. The tongue on the back is cut to fit the dadoes.

Next, I cut a groove on all the workpieces to hold the bottom. I set the rip fence and cut all the grooves at one time so that they were spaced identically.

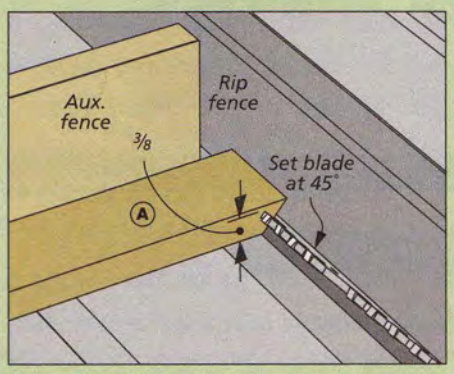
BOTTOM. The bottom of each shelf is just a piece of 1/4" plywood cut to size. I trimmed the front corners of the bottom to make room to insert the splines.

WINE RACK. If you plan to turn one of the shelves into a wine rack, you'll need to drill out the cutouts on the shelf front before assembly (detail 'c'). For a tip on drilling the cutouts see the box below.

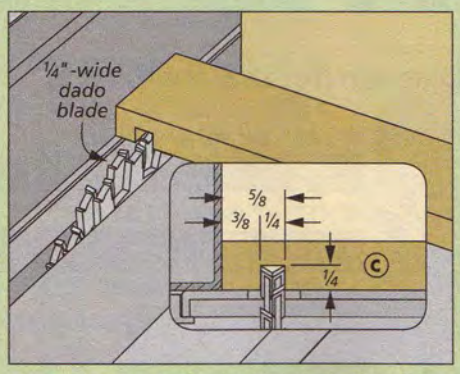
ASSEMBLE THE BOX. Once you have all the workpieces ready to go, you'll be able to assemble the shelf. To keep all four sides square during assembly, I used a 3/4" plywood spacer the same size as the interior of the box.

After the glue is dry, you can trim the splines on the front corners with a chisel. Some sandpaper will clean up any rough spots.

How-To: Shelf Joinery

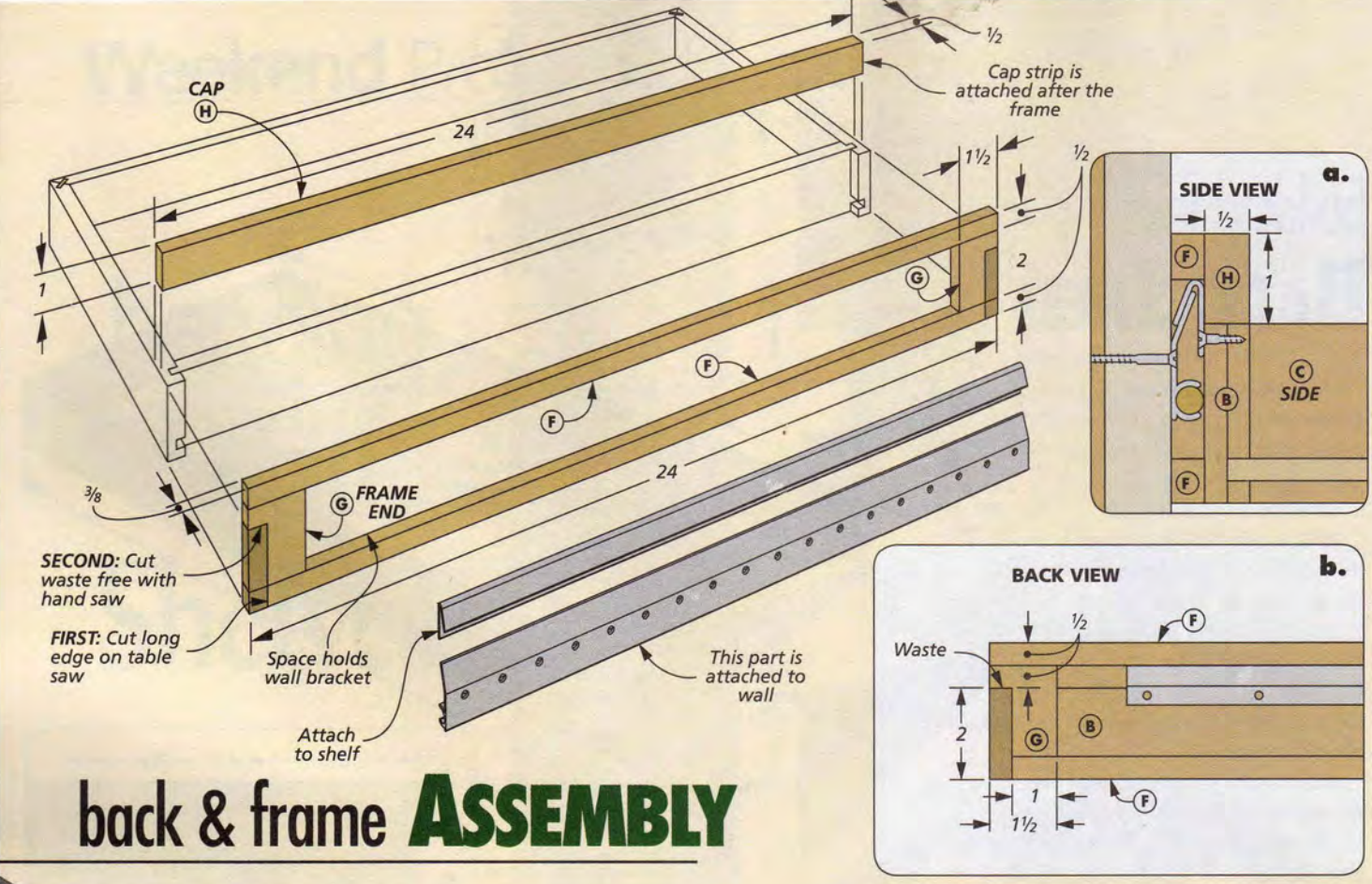


Cut the Slots. *The slots for the splines can be cut on the table saw. Tilt the blade to 45° and raise it to 3/8".*



Back Corner Joinery. *The dado that joins the back and sides can be cut with a dado blade on the table saw.*

▲ Create cutouts for wine bottles by clamping the front to a scrap piece and drilling through the center.



back & frame ASSEMBLY

▲ A small level is included with the bracket for easier installation.

What makes these shelves unique is the invisible mounting system used to hang them on the wall (left photo). The system uses a hanging bracket that's mounted in a recess in the back of the shelf.

FRAME. The recess for the bracket is created by gluing up a frame, as shown above. This frame fits the back of the shelf and is thick enough to conceal the hanging bracket. I decided to glue-up a frame for the back instead of trying to rout out a recess in a solid piece. This also saves lumber.

After gluing up the frame, I cut a notch at each end to allow the frame to fit over the sides of the shelf (detail 'b'). You can cut these notches on the table saw and finish up with a hand saw. When the frame is completed, you can glue it to the back of the shelf.

CAP. Once you have the frame in place, you can glue the cap to the back of the shelf. I added this cap to hide the frame and bracket from view from the front (detail 'a').

BRACKET. The final step is to attach the wall bracket. The two-piece bracket I chose has one piece that is screwed to the back of the shelf (refer to Sources on page 51). The second part is attached to the wall and comes with a small level that slides into a slot (left photo). This way, you'll be able to attach the wall portion and be certain it is level. Be sure to anchor the bracket to wall studs or use wall anchors.

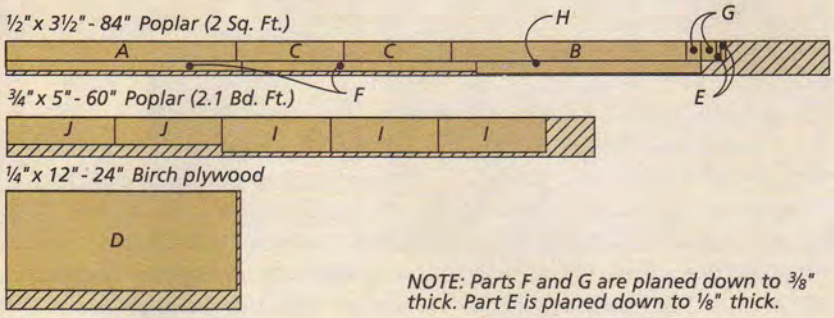
MODIFICATIONS. Modifying a shelf to hold glasses takes a few more steps than the wine bottle rack, but it's not complicated. The box on the opposite page will take you through the process. I've also included a couple of different styles on page 19.

Once you've put a finish on the shelves, all that's left is to hang them on the wall. W

Materials, Supplies & Cutting Diagram (for one shelf/rack)

A	Front (1)	½ x 2 - 24
B	Back (1)	½ x 2 - 23½
C	Sides (2)	½ x 2 - 11
D	Bottom (1)	¼ ply. - 10⅛ x 23½
E	Splines (2)	⅛ x 2¼ - ½
F	Frame Top / Bottom (2)	⅜ x ½ - 24
G	Frame Ends (2)	⅜ x 1½ - 2
H	Cap (1)	½ x 1 - 24
I	Center Glass Rack (3)	¾ x 3½ - 11
J	End Glass Rack (2)	¾ x 2¾ - 11

- (1) 18" Cabinet Hanging Bracket w/screws
- (20) #8 x 1¼" Fh Woodscrews



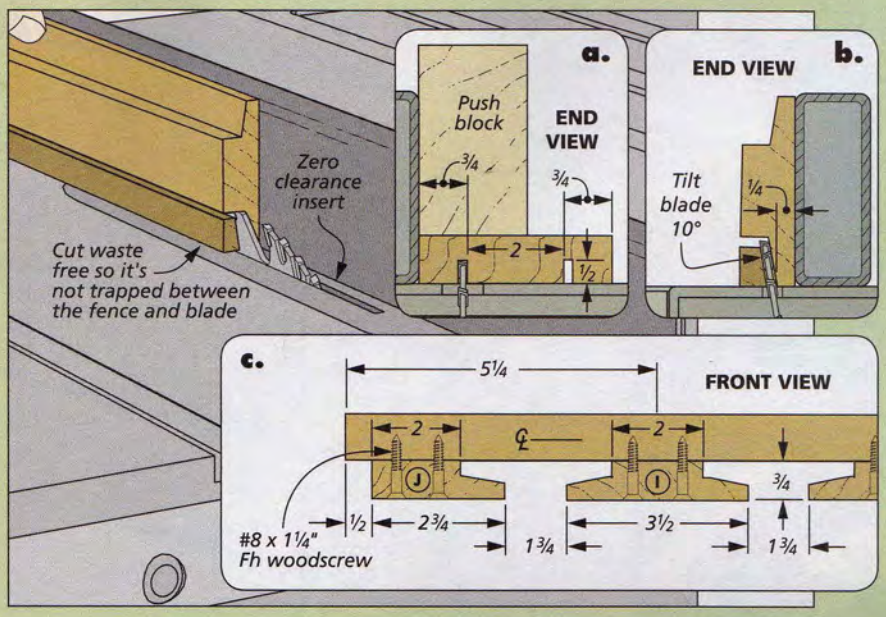
NOTE: Parts F and G are planed down to ⅜" thick. Part E is planed down to ⅛" thick.

How-To: Glass Racks

Adding brackets to the bottom of one of the shelves allows you to store wine glasses. And it leaves the top of the shelf free for storing other items.

This shelf needs two types of brackets to complete the glass racks. The middle brackets are double-sided to hold glasses on either side. The end brackets have just one side that holds the glass (detail 'c').

MITERS. After the bracket blanks have been cut to size, you can cut a kerf in the top as shown in detail 'a.' Next, remove the waste with a 10° bevel cut. To allow the waste to fall away safely from the blade, hold the bottom of the rack against the rip fence (detail 'b'). Then it's just a matter of attaching the racks to the bottom of the shelf with screws.



DESIGNER'S NOTEBOOK

Design Options

Changing the style of this shelf is as simple as altering the choice of materials and adding a little detail to the front. It's an easy way to match your home decor.

The top photo on the right shows a Craftsman-style shelf. I used quartersawn oak to make the shelf. The Craftsman look is created by adding four false tenons to the front on each end. The 1/2"-square tenons are cut to expose the end grain. I spaced them 1/2" from the end of the shelf and 1/8" apart in a square pattern. They stand 1/16" proud. The tenons fit into 1/4"-deep routed mortises in the front.

The bottom photo shows a shelf made from mahogany. I used a triple-bead router bit to make the profile around the front and sides after the shelf was assembled. You can find information about this bit and the stains I used to finish these two shelves in Sources on page 51.

snack tray Cabinet

How about two, great woodworking challenges in one small package?

This project holds a pleasant surprise — literally. On the surface, you see a small, attractive chest of drawers. The narrow profile of the drawers and classic details are somewhat reminiscent of an old-fashioned spool chest. The simple, traditional styling makes it a good fit for just about any decor.

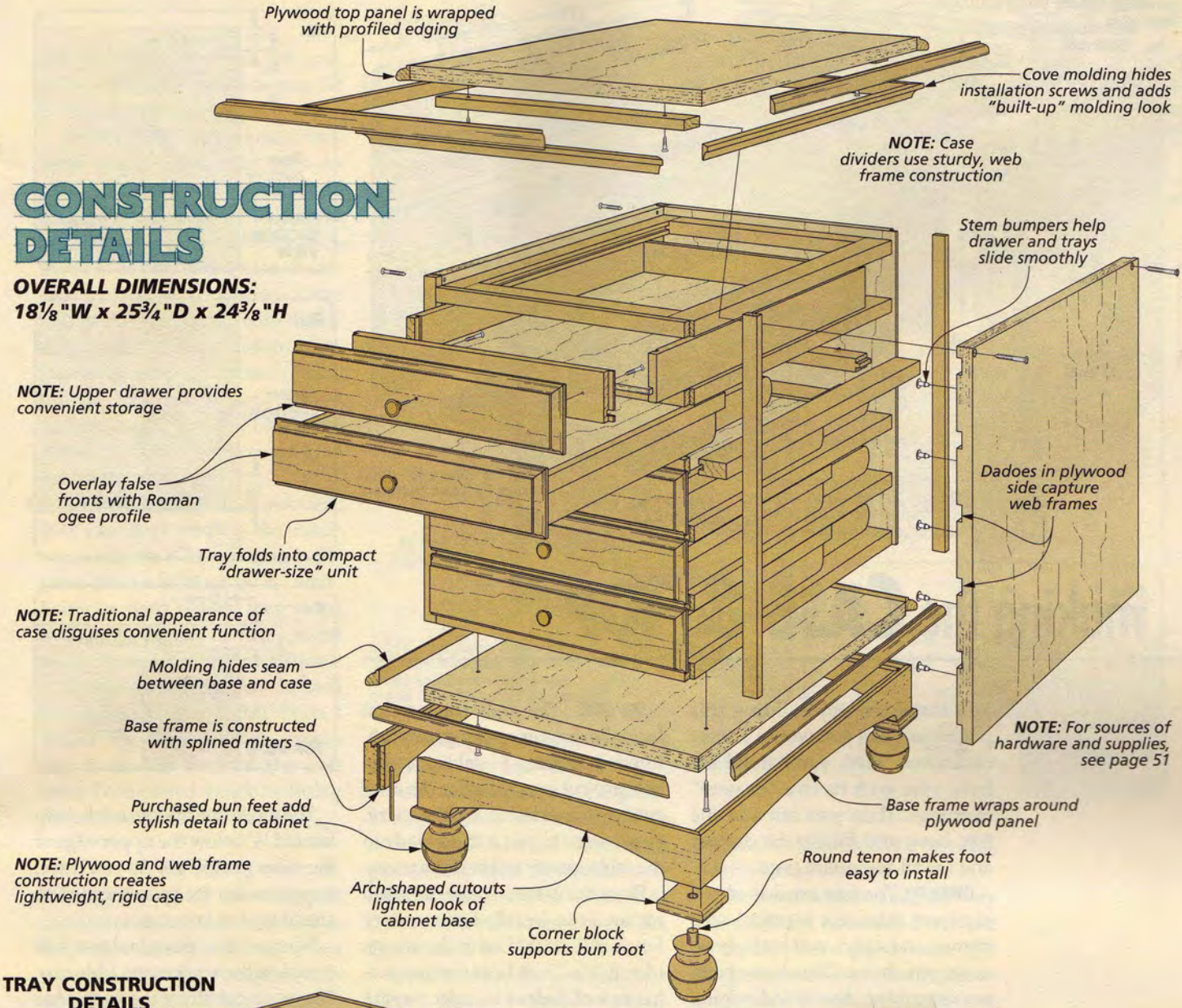
But in function, the chest is not what it appears to be. Open the top drawer and you'll find nothing unexpected — just handy storage for coasters, the TV remote, or maybe a deck of cards. Pull out any of the four lower drawers, and you find something very different. When removed from the case, these "drawers" fold out into compact, snack trays — just the right size for your morning coffee and muffin.

So what you really have here are two great woodworking experiences rolled into one project. The construction starts out like a very typical case project with all the traditional joinery and interesting detail work this involves.

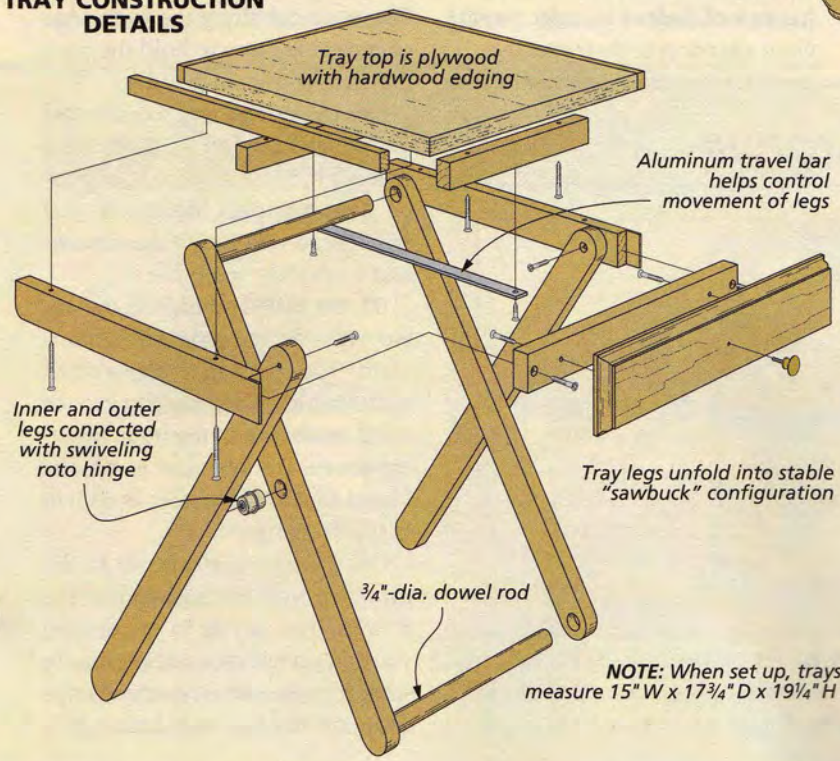
Then after making one simple drawer, you change directions. Building the folding trays is pretty straightforward. But the fact that the trays need to unfold easily and then stand solidly adds a different dimension to the job — one you'll find to be an enjoyable challenge.

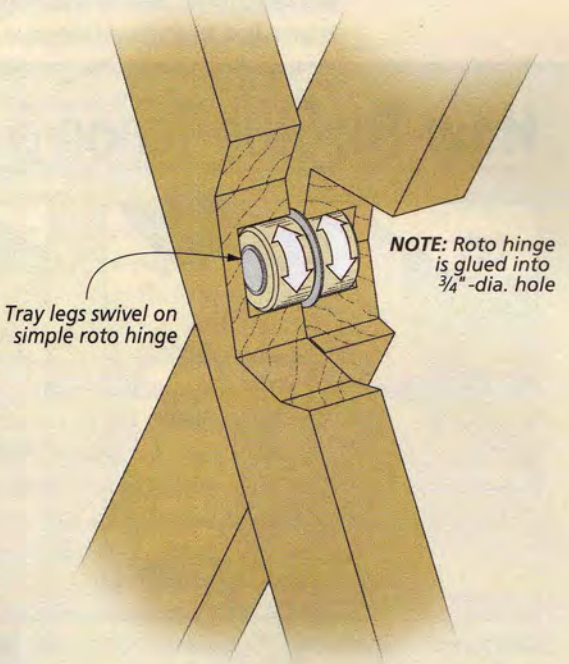
CONSTRUCTION DETAILS

OVERALL DIMENSIONS:
18⅛"W x 25¾"D x 24⅜"H

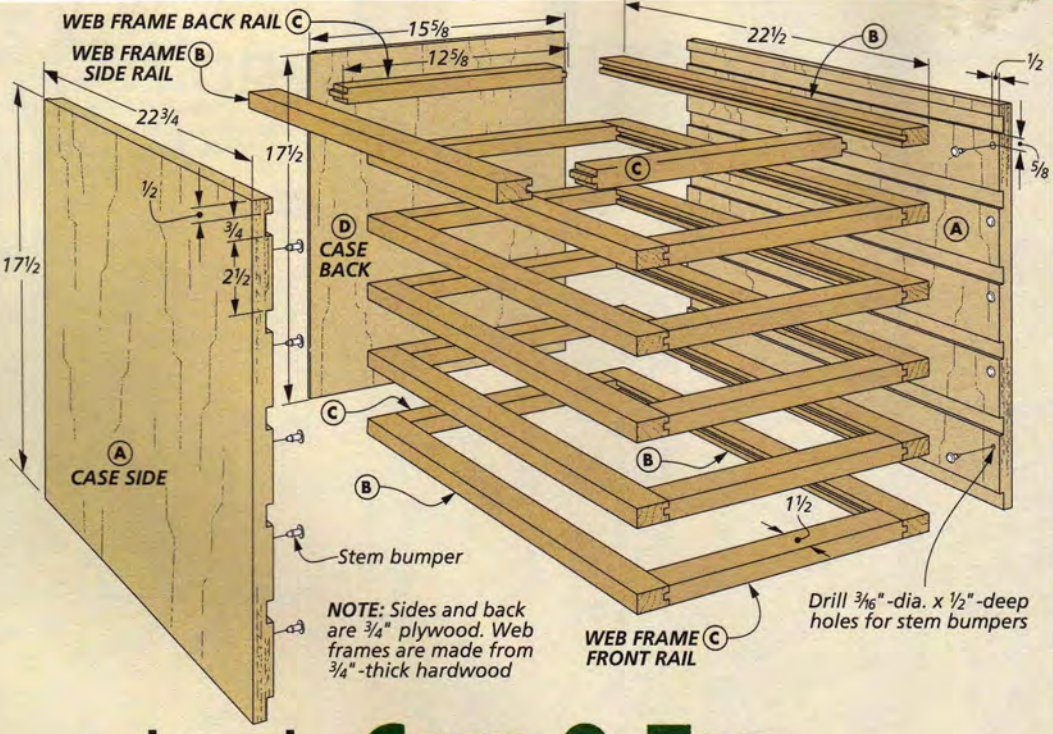


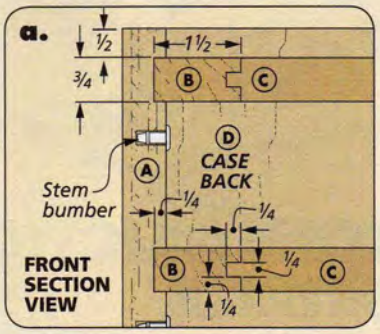
TRAY CONSTRUCTION DETAILS

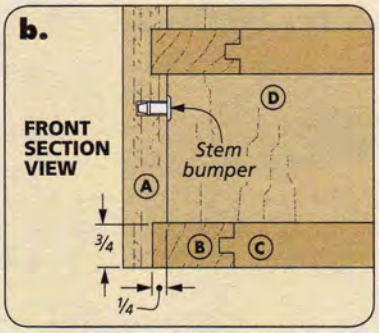


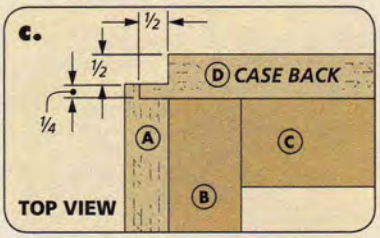


TRAY LEG DETAIL









making the CASE & TOP

You can approach building this project just like you would a chest of drawers. First, you'll build the basic case with its five "drawer" openings. Then you can add the top, base, and finally the drawer and the all-important trays.

OVERVIEW. The case consists of two plywood sides, six identical web frames, and a plywood back panel, as shown above. Once these parts are assembled, hardwood edging is installed to dress up the case.

THE SIDES. The web frames that form the drawer openings are captured in dadoes (a rabbet at the bottom) cut into the sides. So after cutting the sides to finished size, you'll want to put a dado blade in the table saw to tackle this joinery.

Since the bottom frame fits into a rabbet, I also installed an auxiliary fence and started with these cuts (detail 'b'). Then I cut each opposing pair of dadoes in order, paying close attention to their spacing.

The top frame fits into a full dado located ½" below the upper edge of the sides (detail 'a'). As you'll see, this provides the space needed to attach the top later on.

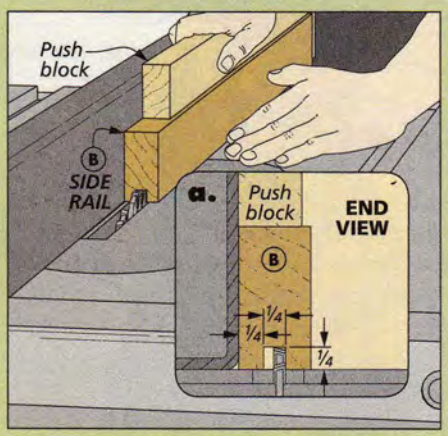
Now, another pair of rabbets will complete the work at the table saw. These are cut along the back edge of each side piece to hold the back panel, as shown in detail 'c.'

One more detail and you can start on the web frames. I drilled some holes in the case sides to hold plastic stem bumpers (details 'a' and 'b'). These will make the drawer and trays slide smoother.

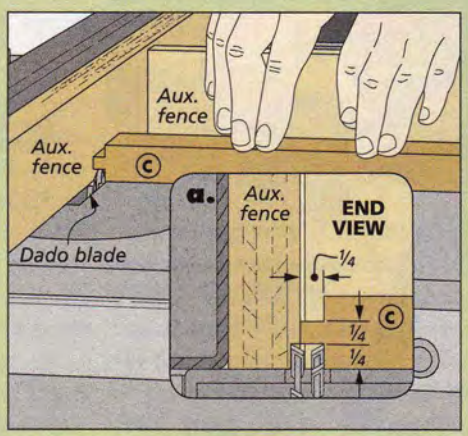
THE WEB FRAMES. Building the six web frames is pretty straightforward. The frames are constructed with simple stub tenon and groove joints, as shown in the main drawing above. The table saw technique I used to cut this joinery is shown in the drawings at left.

Once the tongues are fit to the grooves, you can assemble the frames. The key is to make sure you end up with square, identically sized frames. And when the clamps come off the last web frame, you

How-To: Stub Tenon & Groove



Centered Grooves. *Cut centered grooves in the side rails with two passes, flipping the rail end-for-end in between.*

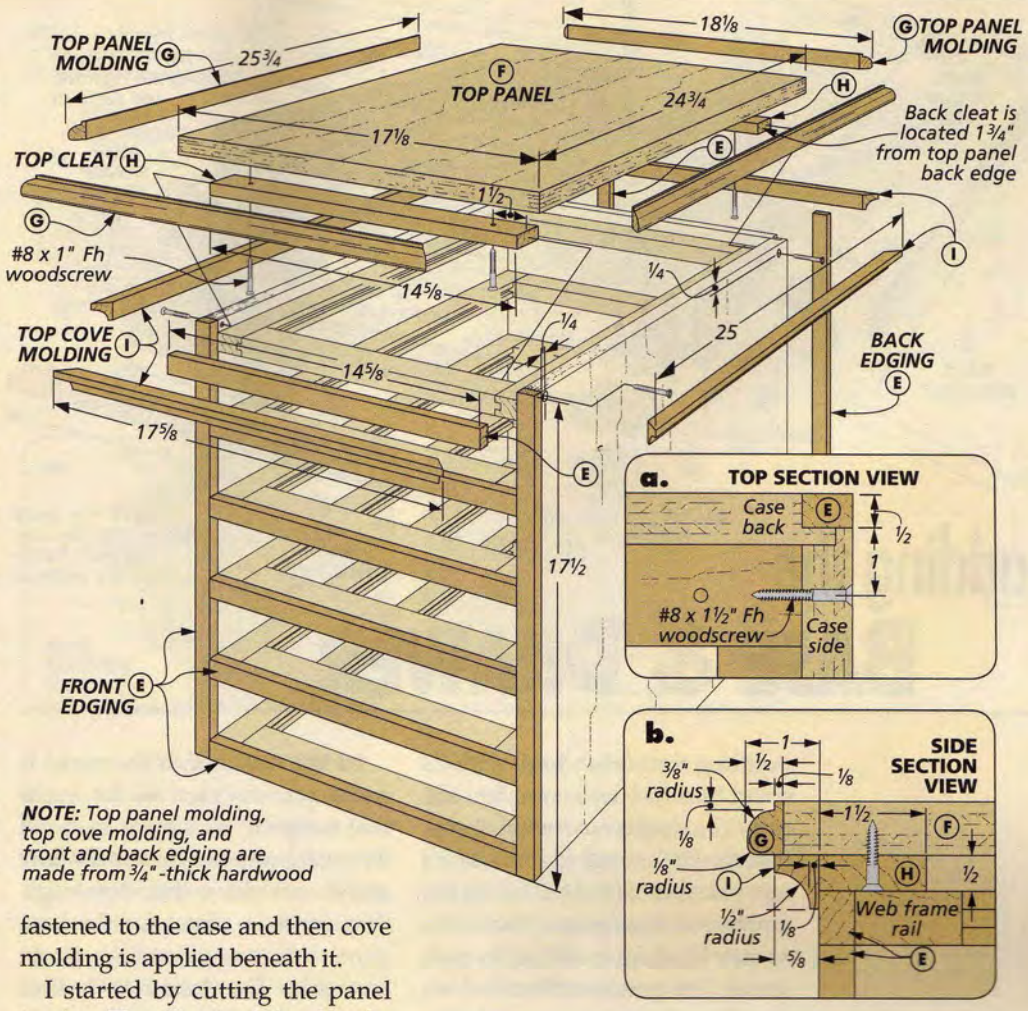


A Tenon to Fit. *A dado blade buried in an auxiliary fence makes quick work of the stub tenons. Sneak up on a snug fit.*

can glue them between the case sides. Again, just make certain the case ends up square.

THE BACK PANEL. The plywood back panel comes next. And the way that I fit it to the case needs a little explanation. In detail 'c' at left you see that when the rabbeted back panel is added to the case, it creates a recess at the corners. Later you'll fill the recess with hardwood edging. This construction gives the back of the case a clean, finished look. Just be sure that the rabbets in the sides and back form a flush surface. Then you can glue the back in place.

THE EDGING. With the back installed, you can start adding the hardwood edging. All the edging is the same size — ½" thick by ¾" wide. I simply made several long strips and then began cutting pieces to fit. First, I completed the case back with an edging piece in each corner (detail 'a' at right). Then, I added the corresponding pieces that cover the front of the case sides. I completed the job by fitting pieces across the web frames.



NOTE: Top panel molding, top cove molding, and front and back edging are made from ¾"-thick hardwood

THE TOP

Making the top of the case goes pretty quickly, so I tackled this next. As you can see above, the top is a plywood panel that's wrapped with a profiled edging. This assembly is fastened to the case and then cove molding is applied beneath it.

I started by cutting the panel to size. Then I cut edging blanks and mitered them to fit around the panel. Only after the blanks were glued to the panel did I take it to the router table to shape the edges, as shown in the drawings below.

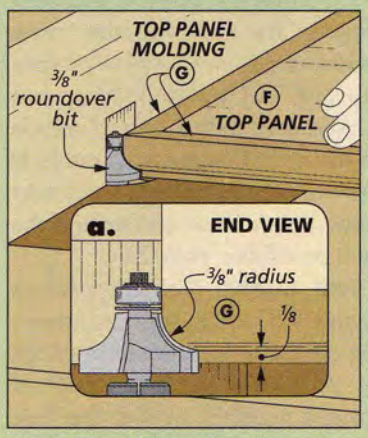
ATTACH IT. With the profiles completed, the top is ready to install. The method here is a little unusual, but it works very well.

The interior of the case has very limited access, so the top is screwed to the case from the outside. You can see how this works in the drawings above. Two, ½"-thick cleats are glued and screwed to the underside of the top. These cleats fit the gap at the top of the case and provide "bite" for screws inserted through the sides. The cove you'll add next will cover the screw heads.

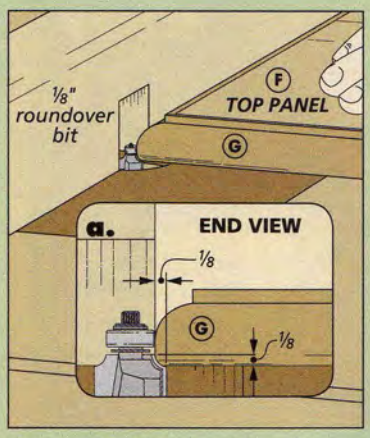
The front cleat is positioned 1" from the front edge of the top and should end up flush with the case edging (detail 'b'). With the cleats in place, the top can be set on the case, the countersunk pilot holes drilled, and the screws installed.

COVE MOLDING. A band of cove molding beneath the top completes this stage (detail 'b'). I made the molding by routing a cove on a wide blank and then ripping the finished piece free. (Note that the molding is not "square" — ⅝" wide by ¾" tall.) The cove is then mitered to fit and glued in place.

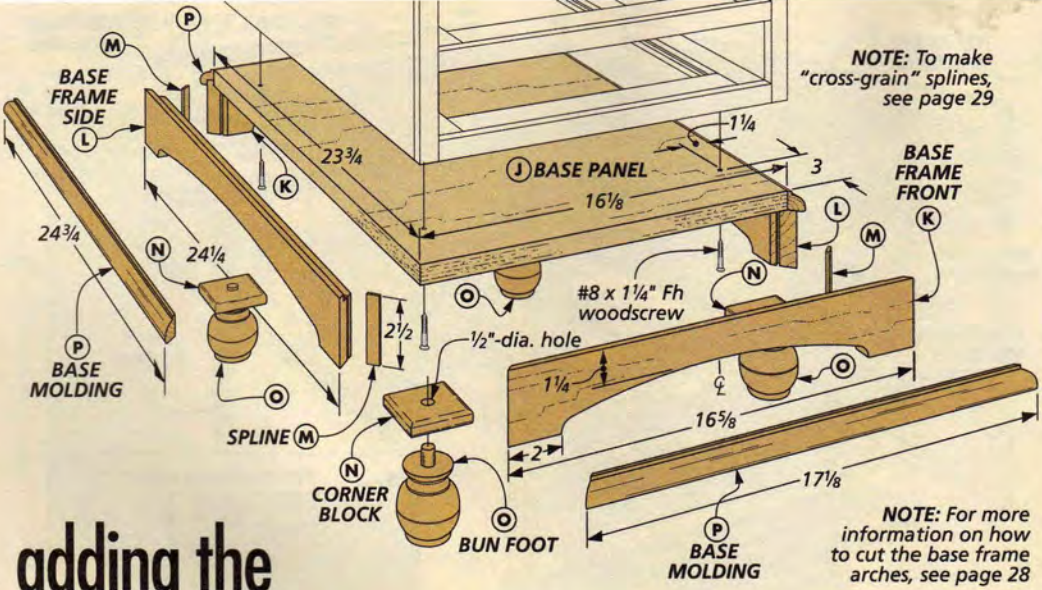
How-To: Edge Profile

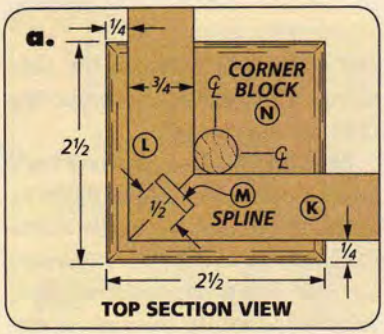


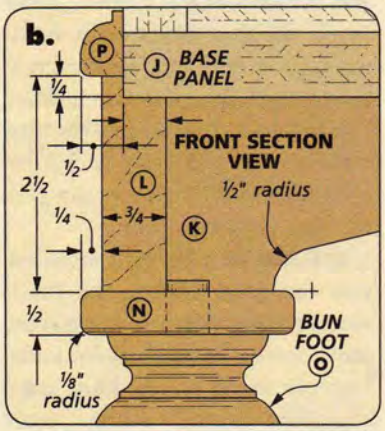
First Cut. *The profile starts with a ⅜" roundover with a fillet routed along the upper edges.*



Second Cut. *To complete the profile, I used a smaller radius bit to ease the lower edges of the top.*







adding the BASE & DRAWER

Building the stylish base with its small bun feet will complete the case. The details are shown above. It starts with an arched frame that's mitered around (and reinforced by) a plywood base panel. Then thin, square blocks are added to each corner. The purchased bun feet are then doweled into these blocks. Finally, a band of molding ties the case and base together.

BASE PANEL. You can begin by cutting the base panel to size from ¾" plywood. It's important that the panel match the footprint of the case. This makes fitting the trim molding easier (detail 'b').

THE BASE FRAME. Once the panel is ready, you can start on the frame that wraps it. As shown in detail 'b,' the frame pieces have a shallow rabbet cut along their top edge. This forms a recess for the base panel that strengthens the frame assembly. The frame is further reinforced with hardwood splines added to the mitered corners.

I built the frame around the base panel. So after cutting the pieces to width and rough length, I installed a dado blade to cut a rabbet along the top edge of each piece.

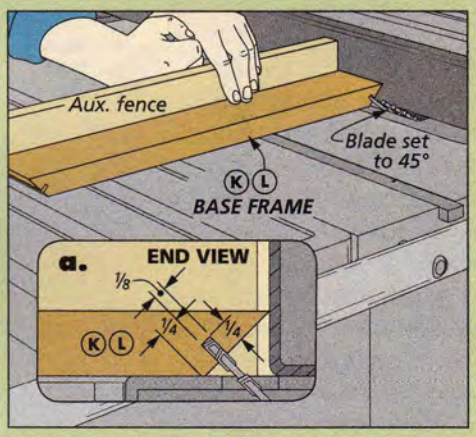
With this step completed, you can switch back to a standard blade and begin mitering the frame pieces. This is essentially a cut-to-fit operation. Just work around the panel carefully fitting each mitered corner in order.

SPLINES. After completing the miters and double-checking the fit (I used a strap clamp to hold the frame around the panel), the next step is to add the splines. The technique I used here is tried and true. The drawing at lower left shows how to cut the saw-kerf on the table saw to hold the splines. Once this is done, you'll make cross-grain splines to fit them. You'll find the technique for this on page 29.

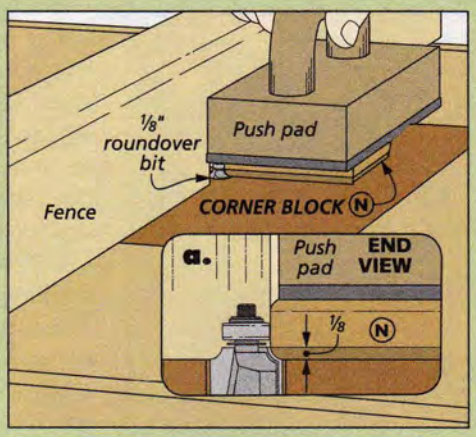
THE PROFILES. With the spline joinery completed, laying out and shaping the arches in the frame pieces comes next. These profiles are laid out by combining two curves. A ½" radius forms the ends of the arch, then a gentle curve is drawn to connect them. You'll find some helpful tips on creating the arch profiles on page 28.

SOME ASSEMBLY. With the profiles completed, you're ready to assemble the frame and the base panel. To do this, I glued the mitered corners together around the base panel (only dry fit) using a couple of strap clamps. When the glueup of the frame pieces is completed,

How-To: Base Details



Spline Slots. *To cut the spline slots in the mitered frame rails, tilt the saw blade to 45° and set the rip fence as an end stop.*



A Careful Roundover. *The keys to routing the roundover on the corner blocks safely are a small insert opening and a push pad.*

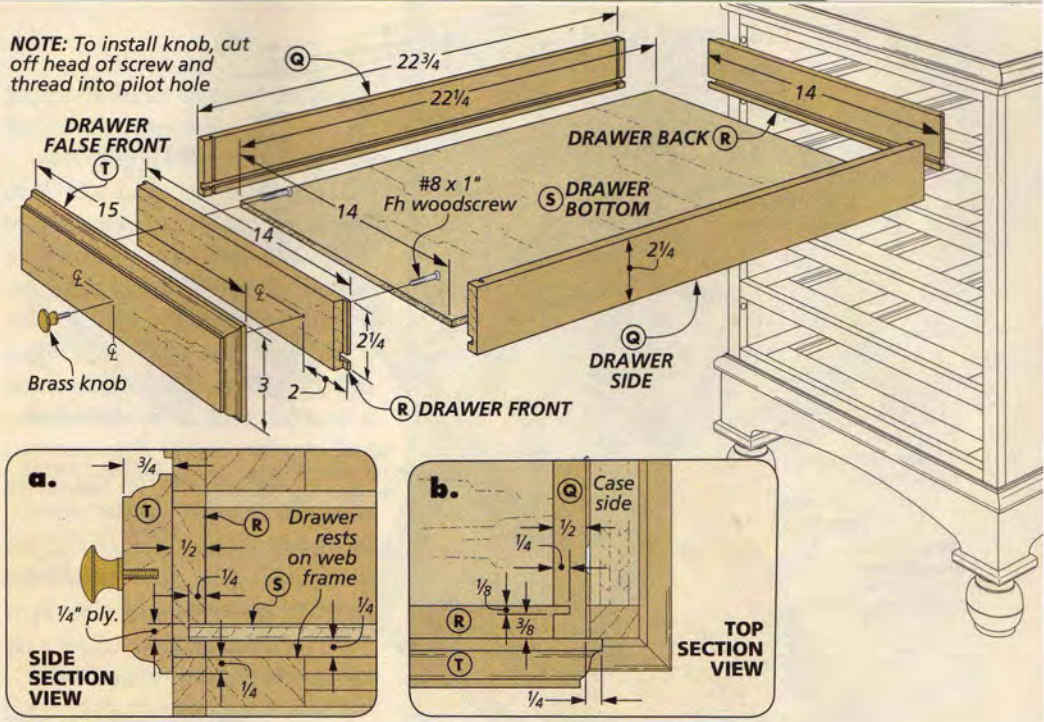
you can finish the job by gluing the base panel in place.

CORNER BLOCKS AND FEET. The hard work on the base is done. Adding the corner blocks and bun feet is a snap. First, you'll need to cut four, 2½"-square blocks from ½"-thick stock. Then ease the edges with a ⅛" roundover (lower right drawing, opposite page). Before gluing them in place, drill a ½"-dia. centered hole through each block. When installed, the blocks should overhang the frame equally on all sides (detail 'b,' opposite page).

The bun feet completes the bottom of the base. Simply glue the round tenon into the holes in the corner blocks (details 'a' and 'b').

FINAL DETAILS. Now you're ready to mate the base with the case. Glue and screws will do the job.

The last step here is to hide the joint between the base and the case with molding. The profile of this molding is identical to that used on the edge of the case top. There's one difference — you'll rout the profile on a wide blank and then rip pieces free on the table saw. The pieces are mitered to fit and rest on lip formed by the base frame, as in detail 'b' on the opposite page.



THE DRAWER

Before building the more challenging trays that fill the lower case openings, I warmed up with the simple upper drawer. All the construction details you'll need are shown in the drawings above.

The ½"-thick front, back, and sides are connected with a tongue and dado joint, as shown in detail 'b.' The ¼" plywood bottom fits into grooves cut in these parts.

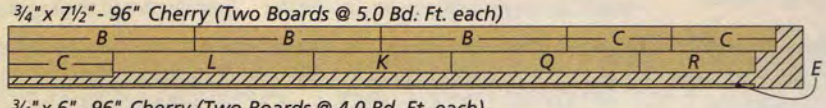
Once the drawer box is assembled, the overlay false front can be added. The four trays use identical fronts, so I made all five at this point. Just cut the blanks to size and rout a Roman ogee around all four edges. Then screw and glue the front to the drawer box. A look at details 'a' and 'b' will guide you in positioning the front. And after adding the knob, you can move on to building the trays.

Materials, Supplies & Cutting Diagram

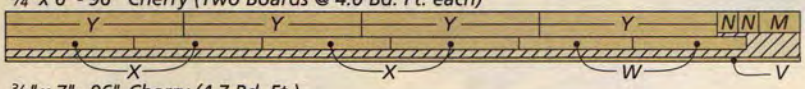
A	Case Sides (2)	¾ ply. - 22¾ x 17½
B	Web Frame Side Rails (12)	¾ x 1½ - 22½
C	Web Frame Frt./Bk. Rails (12)	¾ x 1½ - 12⅝
D	Case Back (1)	¾ ply. - 15⅝ x 17½
E	Case Edging (1)	½ x ¾ - 180 rgh.
F	Top Panel (1)	¾ ply. - 17⅛ x 24¾
G	Top Panel Molding (1)	½ x ¾ - 96 rgh.
H	Top Cleats (2)	½ x 1½ - 14⅝
I	Cove Molding (1)	⅝ x ¾ - 96 rgh.
J	Base Panel (1)	¾ ply. - 23¾ x 16⅛
K	Base Frame Front/Back (2)	¾ x 2½ - 16⅝
L	Base Frame Sides (2)	¾ x 2½ - 24¼
M	Splines (4)	⅛ x 2½ - ½
N	Corner Blocks (4)	½ x 2½ - 2½
O	Bun Feet (4)	2¼ x 2¼ - 2⅝
P	Base Molding (1)	½ x ¾ - 96 rgh.
Q	Drawer Sides (2)	½ x 2¼ - 22¾
R	Drawer Front/Back (2)	½ x 2¼ - 14
S	Drawer Bottom (1)	¼ ply. - 22¼ x 14
T	Drawer/Tray False Fronts (5)	¾ x 3 - 15
U	Tray Tops (4)	¾ ply. - 13½ x 15½
V	Tray Top Edging (1)	½ x ¾ - 192 rgh.
W	Tray Front Rails (4)	¾ x 1½ - 13¾
X	Tray Side Rails (8)	¾ x 1½ - 15½
Y	Tray Legs (16)	¾ x 1½ - 21½
Z	Connecting Rods (8)	¾-dia. - 10½
AA	Stop Bars (8)	¾ x 1⅛ - 9

- (10) Stem Bumpers
- (8) ¾"-dia. Roto Hinges
- (5) 1"-dia. Brass Knobs w/Screws
- (1) ⅛" x ¾" Alum. Bar (5 Ft. long)
- (8) #8 x ¾" Fh Woodscrews
- (4) #8 x 1" Fh Woodscrews
- (20) #8 x 1¼" Fh Woodscrews
- (28) #8 x 1½" Fh Woodscrews
- (16) #8 x 2" Fh Woodscrews
- (2) ¾"-dia. Cherry Dowels (48" long)

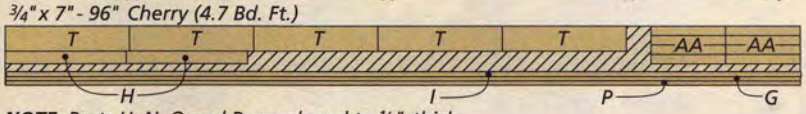
¾"x 7½" - 96" Cherry (Two Boards @ 5.0 Bd. Ft. each)



¾"x 6" - 96" Cherry (Two Boards @ 4.0 Bd. Ft. each)

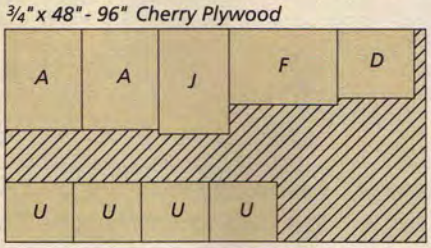


¾"x 7" - 96" Cherry (4.7 Bd. Ft.)

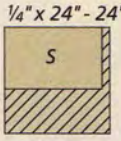


NOTE: Parts H, N, Q and R are planed to ½" thick

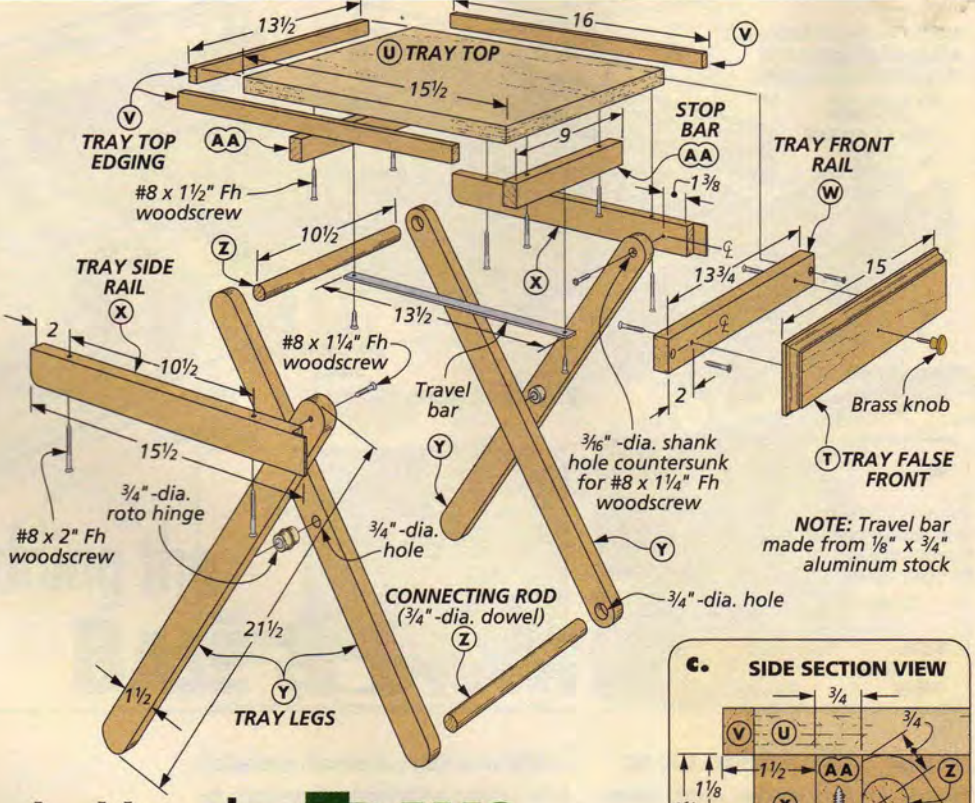
¾"x 48" - 96" Cherry Plywood

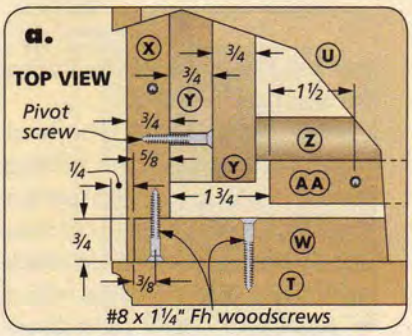


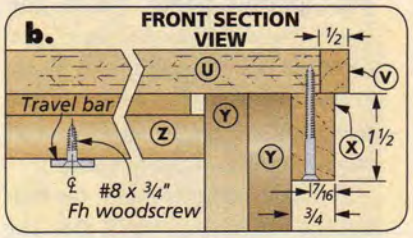
¼"x 24" - 24" Cherry Plywood

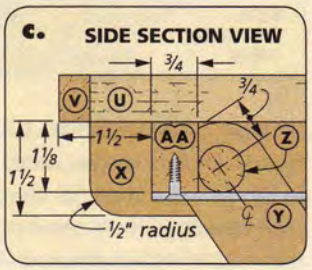


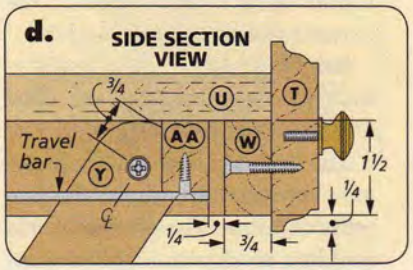
***ALSO NEEDED:** Four pre-turned bun feet*











building the TRAYS

▲ Roto hinges allow the tray legs to swivel.

Now comes the unique part of the project — making the four handy trays. But before jumping into the construction, it's helpful to familiarize yourself with how the trays fold and unfold. The drawings on the opposite page show how the legs swing down and then swivel into a "sawbuck" configuration. It works great and it's easy to build.

JUST GLUE AND SCREWS. The joinery for the trays is very basic — mainly just glue and screws. But since the trays have movable parts, accurate work is important. Just take care to size the parts correctly and assemble them carefully, and the trays will operate smoothly.

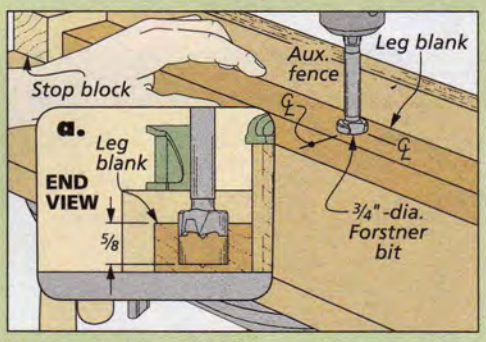
THE TRAY TOPS. I started by making the tray tops. These are simply ¾" plywood panels with ½"-thick edging applied to the sides and back, as shown in the drawing above. (A false drawer front will cover the front edge of the top.) Note that for simplicity, the edging isn't mitered at the corners. The side pieces simply lap over the back piece.

THE LEG FRAME. Next, I added the frame that the leg assembly will be attached to and pivot on. This three-piece frame is screwed and glued to the underside of the top.

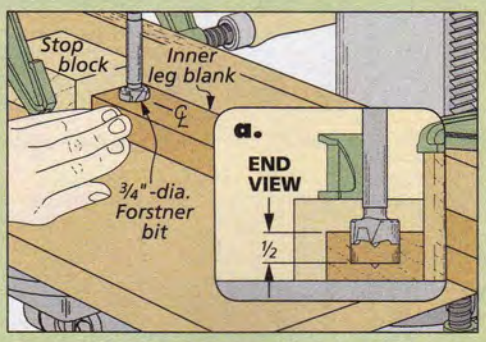
I used a rabbet joint reinforced with screws to assemble the frame sides and front (detail 'a'). A dado blade will handle this joinery.

Now, there's a short list of details to take care of before you attach the frame. First, I rounded the back corner of each side rail to prevent it from catching when inserted into

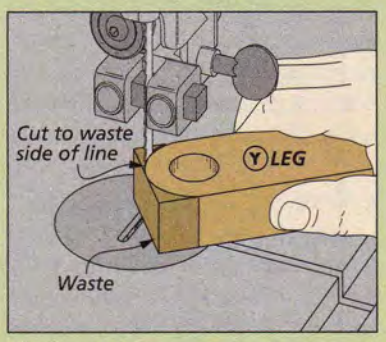
How-To: Pivoting Leg Construction



Roto Hinge Holes. *Use a fence and stop block to accurately position the hinge holes in all the legs. Be careful not to drill too deep.*



Connecting Rod Holes. *Next, reposition the stop block to drill the holes for the connecting rods on the inside face of each inner leg.*



Shape the Legs. *Round both ends of all the legs at the band saw and then sand them smooth.*

the case (detail 'c,' opposite page). Next, I pre-drilled pilot holes for the pivot screws that hold the legs to the frame, as seen in detail 'a,' opposite. Finally, I pre-drilled the countersunk screw holes needed to attach the drawer fronts.

When the frame is installed, center it side to side with the front rail flush to the front edge of the top, as in detail 'd' on the opposite page.

DRAWER FRONTS. With the frames in place, you can add the drawer fronts that you made earlier. You'll have an easier time doing this before installing the leg assemblies (detail 'd' on opposite page). The knobs can wait until later.

THE LEGS. Now comes the really interesting work — making the swiveling leg assemblies. The drawings below do a good job of leading you through the process. I'll just fill in any gaps.

SIXTEEN BLANKS. To get started, you'll need to cut 16 identical leg blanks to size. Before going any further, divide them into two sets of eight inner and outer legs. Then mark an inside and outside face on each blank, and a top and bottom. This will help keep things straight.

MULTIPLE HOLES. Once you've marked the leg blanks, the next step is to drill the holes for the roto hinges that connect the inner and outer legs (margin photo on opposite page). These ¾"-dia. holes are centered on the length and width of the legs. But also note that the holes are drilled on the outside face of the inner legs and the inside face of the outer legs.

Next, you'll need to drill a pair of ¾"-dia. holes on the inside face of each inner leg to hold the dowel rods that connect them. And then one more series of holes and you're done at the drill press. As I noted earlier, the outer legs pivot on a screw installed through the leg and into the leg frame. This requires a countersunk shank hole on the inside face of these blanks.

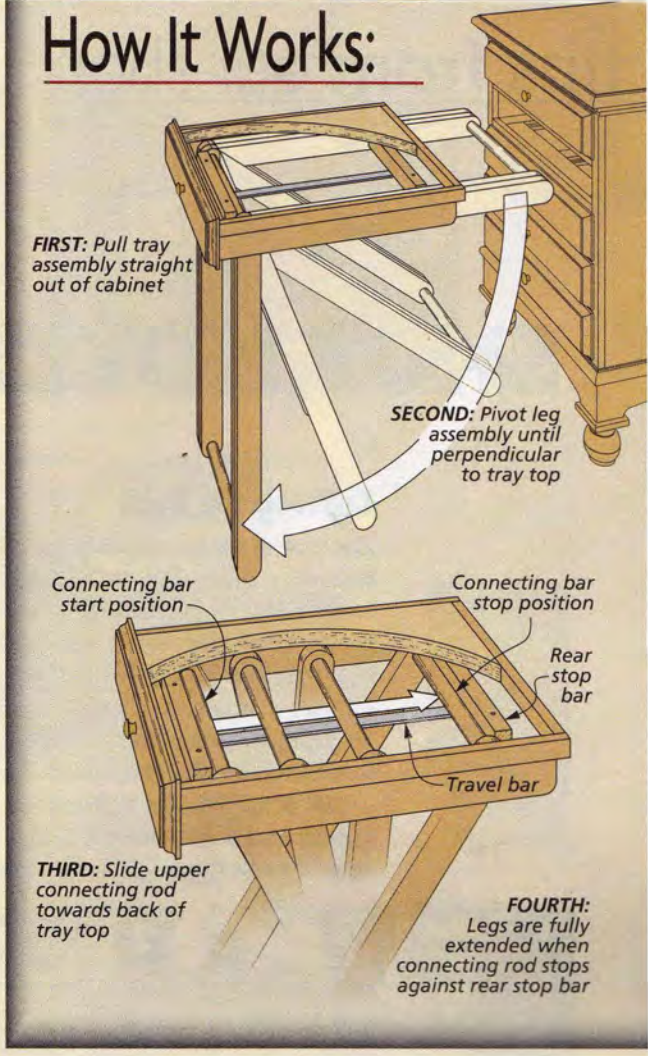
ROUND THE ENDS. Now to complete the legs, I rounded both ends of all the blanks. This will allow them to pivot without binding and also give the tray a stable footing.

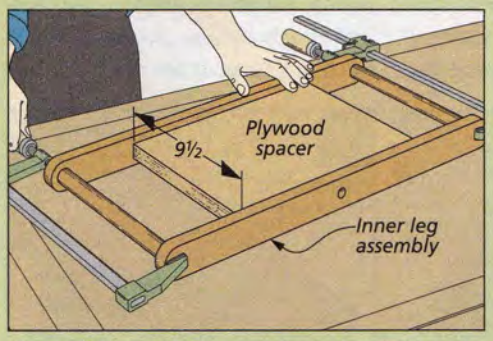
ASSEMBLY. After cutting the dowel connecting rods to length, you can assemble the inner leg frame. I used a spacer to help keep the assembly square and parallel. Then glue a roto hinge into each inner leg and finally add the outer legs.

STOP BARS AND RETAINER. Before completing the installation of the legs, you need to make a few more parts. A stop bar will be positioned near the front and back of the top to control the movement of the legs and to provide attachment points for the aluminum travel bar (details 'c' and 'd' opposite page).

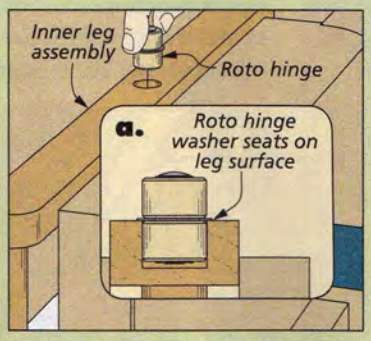
When the stop bars are ready, flip the tray upside down on the bench and install the leg assembly by inserting the pivot screws. With the legs lying flat, the front stop bar is screwed and glued adjacent to the upper connecting rod. The rear stop bar is positioned as shown in detail 'c' on the opposite page. Finally, to make the trays functional, all you need to do is make and install the travel bars. And after adding the knobs, it's off to the finish room.

Now don't get anxious and rush through the finish. Take the time to do it right, because this project is sure to see some serious use. W

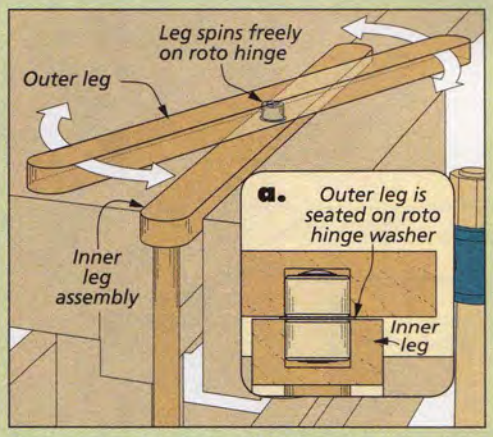




Assembly with Spacer. *I sandwiched a plywood spacer between the legs to help keep the assembly square and accurately sized.*



Roto Hinge. *To add the outer legs, first glue one end of a roto hinge into each inner leg.*



Complete the Assembly. *The final step is to glue an outer leg to the other end of each hinge. The outer legs should spin freely.*

SHOP NOTEBOOK

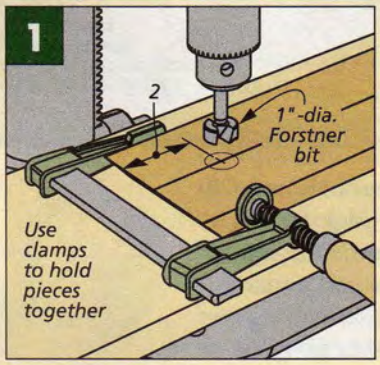
Cutting an Arch

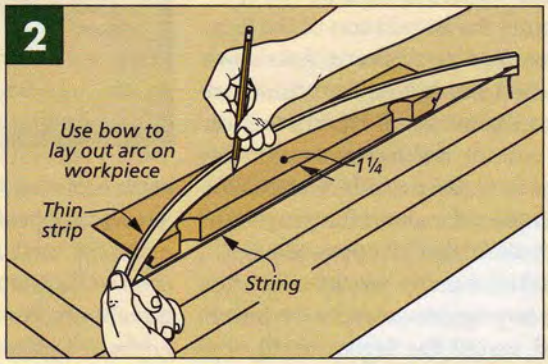
The base of the cabinet on page 20 features a decorative arch on the lower edge. As you can see in the photo above, the arch is made up of a long, shallow curve that terminates in a tight arc at each end. To create this arch, I used a simple, three-step process.

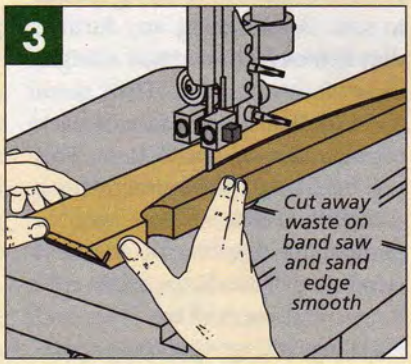
START AT THE ENDS. The tight curves at each end of the arch are 1"-dia. arcs. To make these, I drilled a hole using a Forstner bit. By clamping the frame rails edge to edge, like you see in Figure 1, I was able to drill a semi-circular hole in both rails at the same time.

LAY OUT CURVE. After drilling a hole near each end of the rails, the next step is to lay out the main curve of the arch. To do this, I used a bow made out of a thin strip of hardwood and a piece of string. The string fits into narrow kerfs cut at each end of the thin strip. By tying a knot at each end of the string, you can flex the hardwood strip just enough to create a smooth curve, as shown in Figure 2.

With the curve laid out, all you have to do is cut away the waste on the band saw (Figure 3). Then the profile can be sanded smooth using a sanding drum on the drill press.





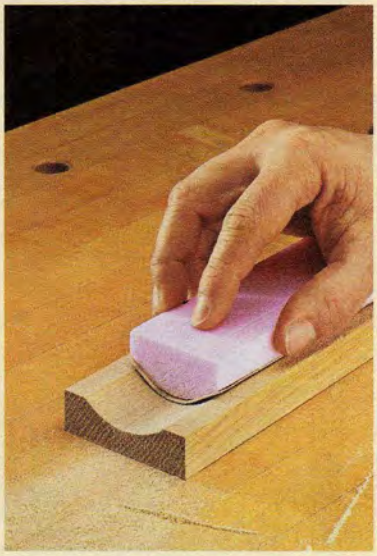


Cove Sanding Block

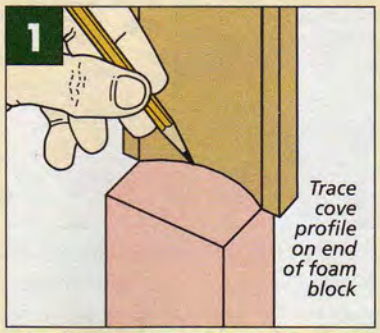
The cove molding for the media center on page 30 is made at the table saw. But the saw blade leaves a series of rough ridges in the cove that have to be sanded out.

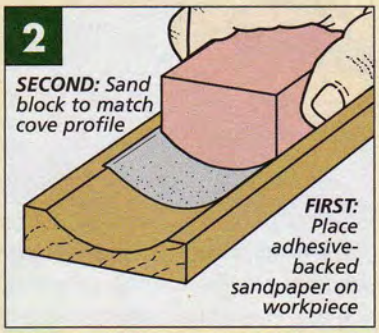
To do this, I made a custom-shaped sanding block out of a piece of 1½"-thick foam insulation board (photo at left). Start by tracing the profile of the cove on the end of the block, as shown in Figure 1.

After cutting away most of the waste on the band saw, you can attach a piece of sandpaper to the cove molding and sand the block to match the profile (Figure 2). Then just attach a piece of sandpaper to the block to sand the cove.



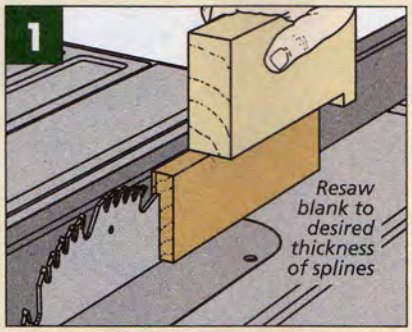
▲ A sanding block fashioned from a piece of foam insulation makes quick work of sanding the cove.

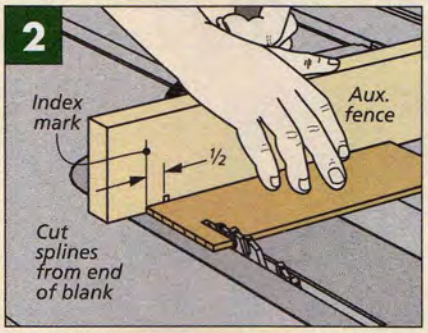




Cross-Grain Splines

The cabinet on page 20 and the wall shelf on page 16 both use miter joints reinforced with cross-grain splines. To make these splines, I started with a blank that matched the length (width) of the splines. Then I resawed an 1/8"-thick strip from the blank (Figure 1) and cut the splines off the end (Figure 2).



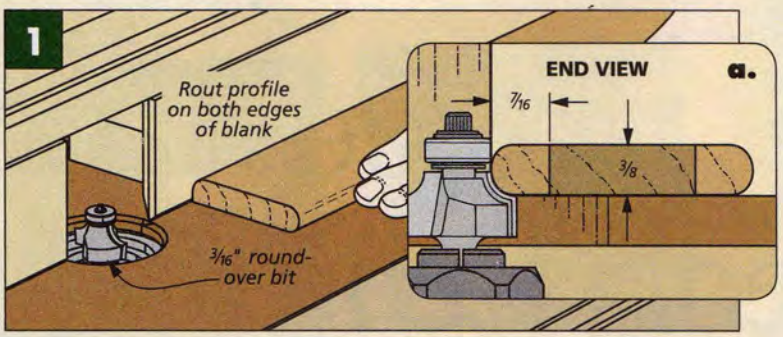


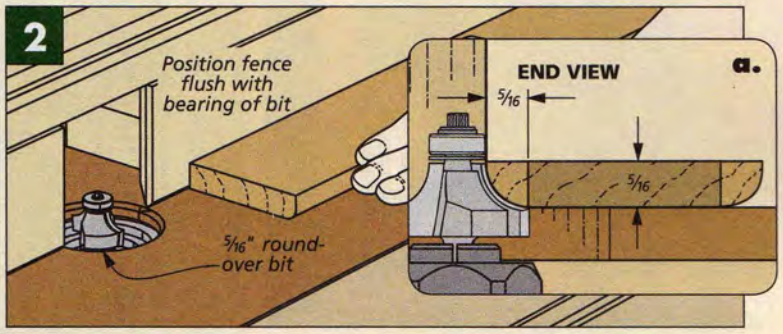
Glass Door Moldings

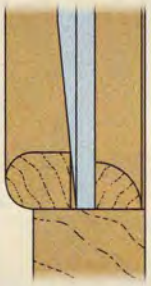
The glass panel doors on the media center feature a bead molding in front of the glass and a quarter-round stop behind the glass (drawing in margin). Although the profiles of the two moldings are different, I used the same technique to make both of them.

Start by planing a wide blank to thickness (3/8" for the bead molding and 5/16" for the quarter round). Then, rout the profile on both edges of the blank. For the bead molding, you'll have to make the profile in two passes, flipping the blank over between passes (Figure 1). The quarter-round molding can be routed in one step (Figure 2).

Once you're done routing the profile, step over to the table saw and rip the moldings to width.







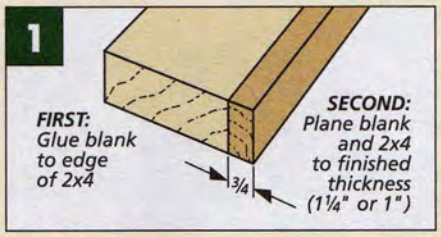
Glass Molding. *Two styles of molding hold the glass panel in place.*

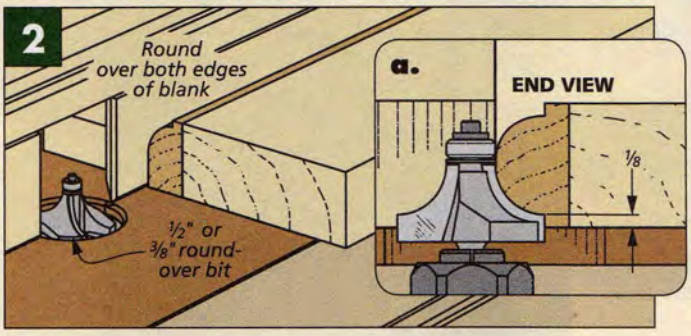
Making Bullnose Moldings

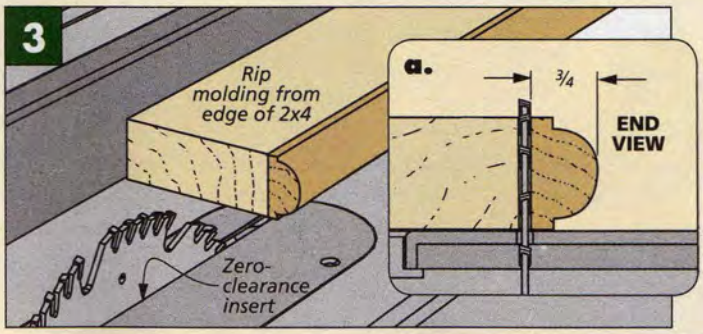
The media center uses two sizes of bullnose moldings. Ordinarily, I would simply rout the profile on the edge of a board and rip the molding free. But the moldings I needed are 1" and 1¼" wide (tall). To avoid having to purchase thicker stock just for these pieces, I came up with a method for making the molding out of ¾"-thick stock.

I started by cutting a 1½"-wide blank from ¾"-thick stock. Then I glued it to the edge of a carrier board (a common 2x4). Next, I planed the blank and carrier board down to the desired width of my molding (Figure 1).

Using a roundover bit, I routed the bullnose profile in two passes at the router table, as shown in Figure 2. The carrier board allows you to rout the profile while keeping your fingers a safe distance away from the bit. Then, I simply ripped the molding free from the edge of the carrier board (Figure 3).







flat-screen Media Center

A modular design makes this media center easy to build and flexible enough to suit your room and components.

Keeping up with changes in technology can be difficult. What's new today can be obsolete tomorrow. Having a media center that allows you to mix and match cabinets to accommodate your changing needs can make the task easier. The versatile design shown here will fit your needs for years to come.

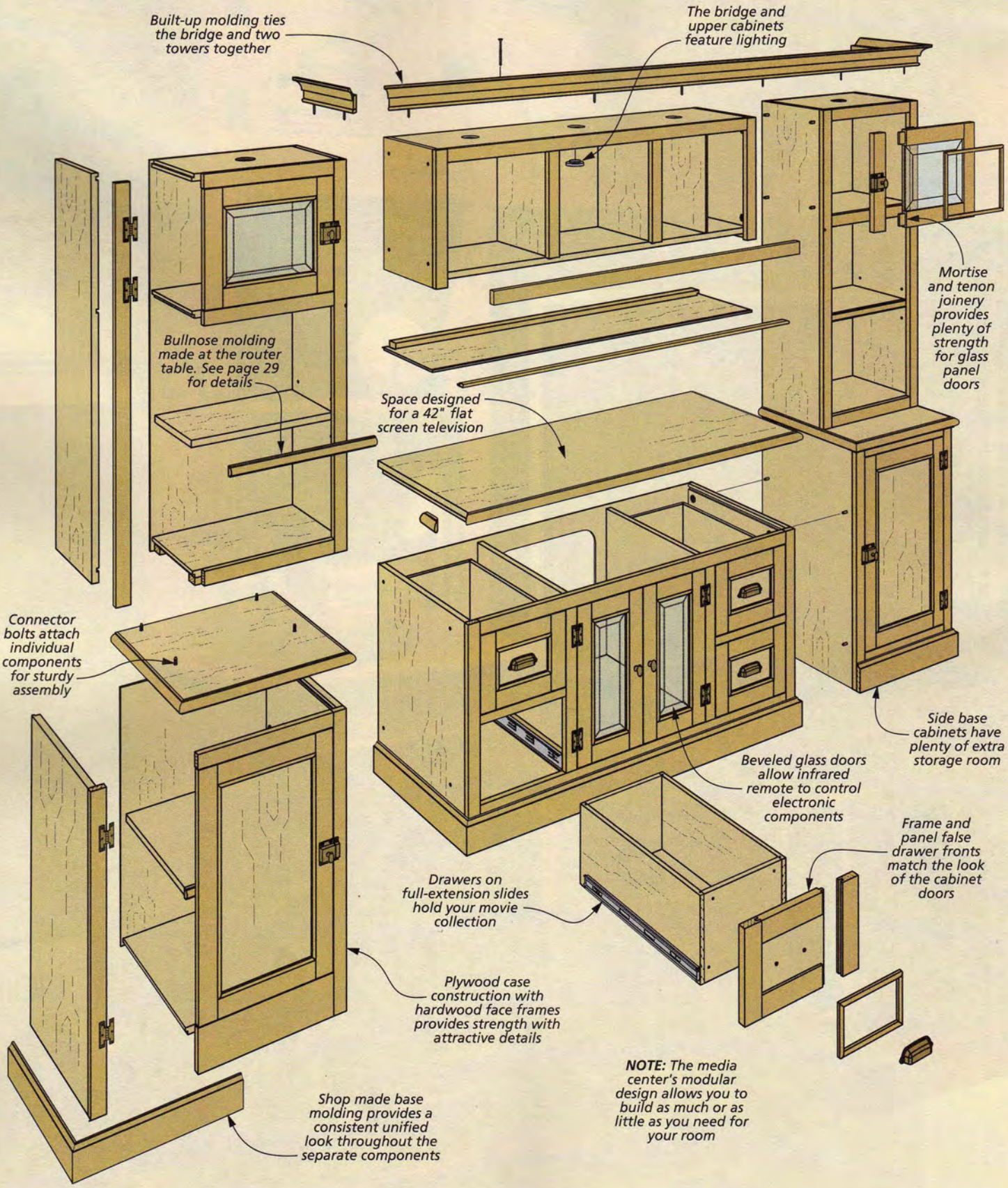
It all starts with a center base cabinet that can handle a 42" television and house a cable/satellite box and other electronic gear. Glass doors allow the signal from your remote to pass through to the components. And drawers on each side provide storage for your DVD collection. As a stand-alone unit, this might be all you need, especially if you have limited space.

But if you have the room and are looking for a little more storage, then adding the side cabinets and the connecting bridge is a breeze. The construction is straightforward throughout. The plywood cases are edged with hardwood and complemented by frame and panel doors and drawers. Decorative moldings add a professional touch and they can all be made in your shop on a table saw and router table.

ROAD
DRAWING
EDWARD
HOPP

CONSTRUCTION DETAILS

OVERALL DIMENSIONS: 86¾"W x 20⅝"D x 76⅞"H
BASE CABINET ONLY: 49½"W x 20¾"D x 25"H



NOTE: *The media center's modular design allows you to build as much or as little as you need for your room*

Materials, Supplies & Cutting Diagram

Base Cabinet

A	Sides (2)	3/4 ply. - 19 1/4 x 24 1/4
B	Case Top/Bottom (2)	3/4 ply. - 19 x 47
C	Vertical Dividers (2)	3/4 ply. - 19 x 19 1/2
D	Horz. Dividers (2)	3/4 ply. - 19 x 13 1/2
E	Back (1)	1/4 ply. - 47 1/2 x 20 1/2
F	Face Frame Ends (2)	3/4 x 1 1/2 - 24 1/4
G	Face Frame Top Rail (1)	3/4 x 1 1/2 - 45
H	Face Frame Bot. Rail (1)	3/4 x 4 1/2 - 45
I	Face Frame Ctr. Stiles (2)	3/4 x 1 1/2 - 18 1/4
J	Face Frame Edging (2)	3/4 x 1 - 11 1/2
K	Top (1)	3/4 ply. - 20 x 48
L	Top Edging (1)	3/4 x 1 1/4 - 96 rgh.
M	Base Molding (1)	5/8 x 3 1/2 - 96 rgh.
N	Component Shelf (1)	3/4 ply. - 18 x 17 1/2
O	Shelf Supports (2)	3/4 x 1 3/8 - 18
P	Shelf Front (1)	3/4 x 1 3/4 - 17 1/2
Q	Drawer Slide Spacers (2)	1/4 x 1 3/4 - 17 1/2
R	Door Rails (4)	3/4 x 2 - 7 7/16
S	Door Stiles (4)	3/4 x 2 - 18 1/8
T	Bead Molding (1)	3/8 x 7/16 - 300 rgh.
U	Glass Stop (1)	5/16 x 5/16 - 96 rgh.
V	Door Stop (1)	3/4 x 1 3/4 - 4
W	Drawer Fronts/Backs (8)	1/2 x 8 - 10 1/2
X	Drawer Sides (8)	1/2 x 8 - 18 1/2
Y	Drawer Bottoms (4)	1/4 ply. - 10 x 18
Z	Drawer Guide Spacers (8)	3/4 x 1 3/4 - 19
AA	False Front Rails (8)	3/4 x 2 - 8 1/8
BB	False Front Stiles (8)	3/4 x 2 - 8 1/2
CC	False Front Panels (4)	1/4 ply. - 8 1/8 x 5 1/4
DD	Filler Strips (4)	1/4 x 1 1/2 - 7 3/8

Side Base Cabinets (for 1 Cabinet)

A	Sides (2)	3/4 ply. - 17 1/4 x 31 1/4
B	Case Top/Bottom (2)	3/4 ply. - 17 x 17
C	Shelf (1)	3/4 ply. - 16 x 16 3/8
D	Shelf Edging (1)	3/4 x 1 - 16 3/8
E	Back (1)	1/4 ply. - 17 1/2 x 27 1/2
F	Face Frame Ends (2)	3/4 x 1 1/2 - 31
G	Face Frame Top Rail (1)	3/4 x 1 1/2 - 15
H	Face Frame Bottom Rail (1)	3/4 x 4 1/2 - 15
I	Base Molding (1)	5/8 x 3 1/2 - 40 rgh
J	Top (1)	3/4 ply. - 18 x 18
K	Top Edging (1)	3/4 x 1 1/4 - 60 rgh
L	Door Rails (2)	3/4 x 2 - 11 5/8
M	Door Stiles (2)	3/4 x 2 - 25 1/8
N	Door Panel (1)	1/4 ply. - 11 5/8 x 21 7/8
O	Bead Molding (1)	3/8 x 7/16 - 65 rgh

Upper Cabinets (for 1 Cabinet)

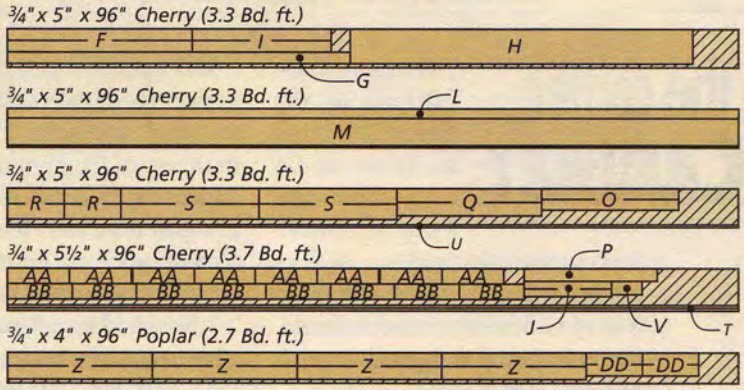
P	Sides (2)	3/4 ply. - 11 1/4 x 42
Q	Top/Bottom/Divider (3)	3/4 ply. - 17 x 11
R	Back (1)	1/4 ply. - 17 1/2 x 42
S	Cleats (2)	3/4 x 1 1/2 - 16 1/2
T	Face Frame Stiles (2)	3/4 x 1 1/2 - 42
U	Face Frame Rails (3)	3/4 x 1 1/2 - 15
V	Shelf (1)	3/4 ply. - 16 3/8 x 10
W	Shelf Edging (1)	3/4 x 1 - 16 3/8
X	Door Rails (2)	3/4 x 2 - 12 7/8
Y	Door Stiles (2)	3/4 x 2 - 12 3/8
Z	Bead Molding (1)	3/8 x 7/16 - 48 rgh.
AA	Glass Stop (1)	5/16 x 5/16 - 48 rgh.

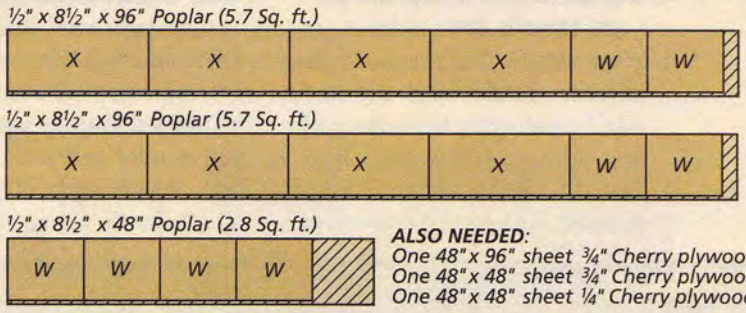
Bridge Cabinet

BB	Top/Bottom (2)	3/4 ply. - 11 x 47
CC	Sides (2)	3/4 ply. - 11 1/4 x 15 1/2
DD	Vertical Dividers (2)	3/4 ply. - 11 x 13 3/4
EE	Back (1)	1/4 ply. - 47 1/2 x 14 3/4
FF	Side Veneer (2)	1/4 ply. - 9 x 13 1/4
GG	Bottom Veneer (1)	1/4 ply. - 11 3/16 x 48
HH	Face Frame Ends (2)	3/4 x 1 1/2 - 15 1/2
II	Face Frame Rails (2)	3/4 x 1 1/2 - 45
JJ	Face Frm. Cent. Stiles (2)	3/4 x 1 1/2 - 12 1/2
KK	Lower Edging (1)	3/8 x 1 1/2 - 48 3/8
LL	Molding Cleat (1)	3/4 x 1 1/2 - 120 rgh.
MM	Bead Molding (1)	3/8 x 15/16 - 120 rgh.
NN	Cove Molding (1)	9/16 x 2 - 120 rgh.

- (5 pr.) 18" Full-ext. Drawer Slides
- (6 pr.) 2 1/2" Hinges w/Screws
- (4) 3" Bin Pulls
- (4) Pantry Latches
- (2) 1 1/4" Oval Knobs
- (2) 5 3/8" x 14 1/16" Beveled Glass Panels
- (2) 10 13/16" x 8 5/16" Beveled Glass Panels
- (5) Xenon Pocket Lights
- (16) Shelf Pegs
- (16) Shelf Peg Sleeves
- (24) 1/4"-20 Long-Barrel T-Nuts
- (16) 1/4"-20 x 35mm Connector Bolts
- (8) 1/4"-20 x 50mm Connector Bolts
- (11) #8 x 3" Fh Woodscrews
- (16) #8 x 2" Fh Woodscrews
- (8) #6 x 3/4" Fh Woodscrews
- (2) 1/2"-dia. Rare-Earth Magnets w/Cups
- (1 pkg.) 5/8" Brads

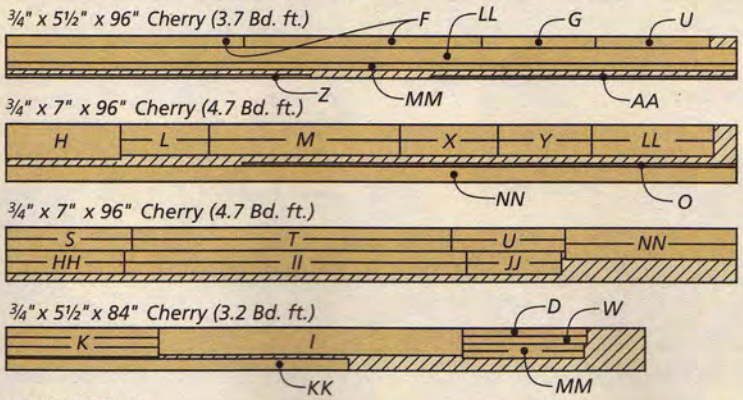
Center Base Cabinet





ALSO NEEDED:
One 48" x 96" sheet 3/4" Cherry plywood
One 48" x 48" sheet 3/4" Cherry plywood
One 48" x 48" sheet 1/4" Cherry plywood

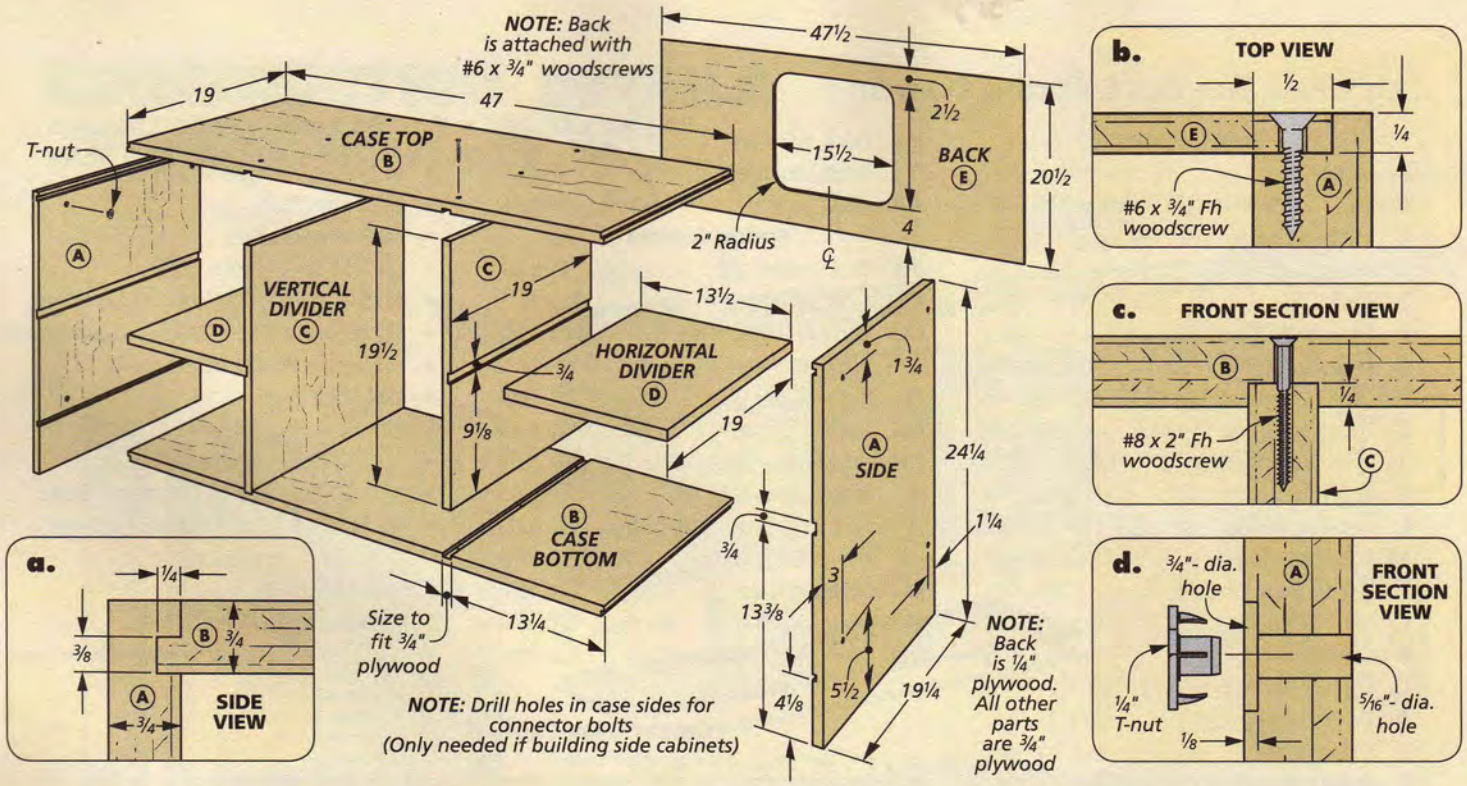
Side Base, Upper, and Bridge Cabinets



ALSO NEEDED:
One 48" x 96" sheet 3/4" Cherry plywood
One 48" x 96" sheet 1/4" Cherry plywood
One 48" x 48" sheet 3/4" Cherry plywood

Woodsmith GO ON-LINE EXTRAS

For the plywood cutting diagram, visit our website at Woodsmith.com.



start with the center BASE CABINET

The center base cabinet is the heart of this modular media center. It provides a sturdy platform for your television and houses other electronic gear below. And though it may look complicated to build, it's really pretty straightforward. It all starts with a well-built case.

THE PLYWOOD CASE. Cabinet-grade plywood with dado joinery ensures a stable and sturdy finished product. I chose cherry, but any hardwood plywood will work fine. The key is to find straight-grained stock for the face frame.

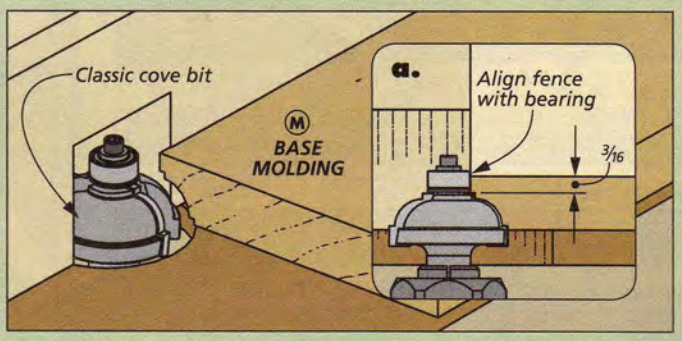
SIDES. I started by cutting the sides to size. Then, with a dado blade in the table saw sized to match the thickness of the plywood, I cut the dadoes for the dividers. You'll need to adjust the size of the dado blade for a ⅜"-wide cut for the dado that will hold the top and bottom (detail 'a'). Now add the rabbet on the back edge to hold the back (detail 'b').

TOP & BOTTOM. The case top and bottom both need dadoes to hold the vertical dividers. Once again, this is an easy cut on the table saw. With the dadoes complete, flip the pieces over and mark the centerline of each dado. Then countersink holes for screws (detail 'c').

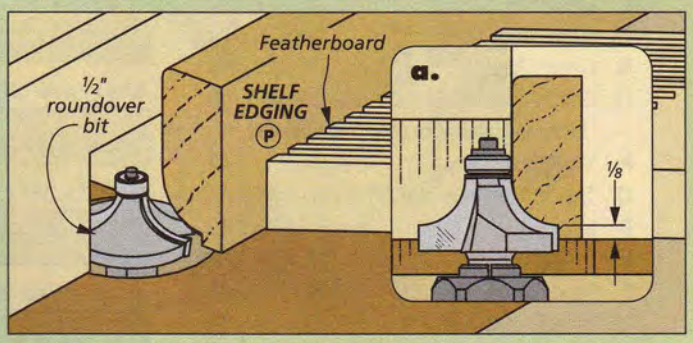
VERTICAL & HORIZONTAL DIVIDERS. After cutting the dividers to size, all you need to do is add the dado centered on the vertical dividers. As you can see in the drawing above, the horizontal dividers fit in these dadoes and the ones in the sides. With these cuts complete, you're ready to start assembling the case.

ASSEMBLY. The nice thing about dado joinery is that it takes the hassle out of aligning parts during the glueup. You can start by attaching the top and bottom to the vertical dividers with glue and screws. It's best to lay the assembly on its front edge to keep the edges aligned while driving the screws.

How-To: Make Molding and Edging



Base Molding. *With the fence set flush with the bearing and the bit raised to expose the bottom fillet, you can rout the profile for the base molding with the workpiece flat on the table.*



Component Shelf Edging. *Rout the edging for the component shelf with the workpiece vertical against the fence. Raise the roundover bit to leave a square cut at the bottom.*

The next step is to add the horizontal dividers and the sides. Tongues on the top and bottom fit into the dadoes on the sides, making this an easy assembly.

One thing to note before attaching the sides is the placement of the T-nuts used to connect other components. If you decide to add the side cabinets, you'll need to drill counterbored holes, as shown in detail 'd' on the opposite page.

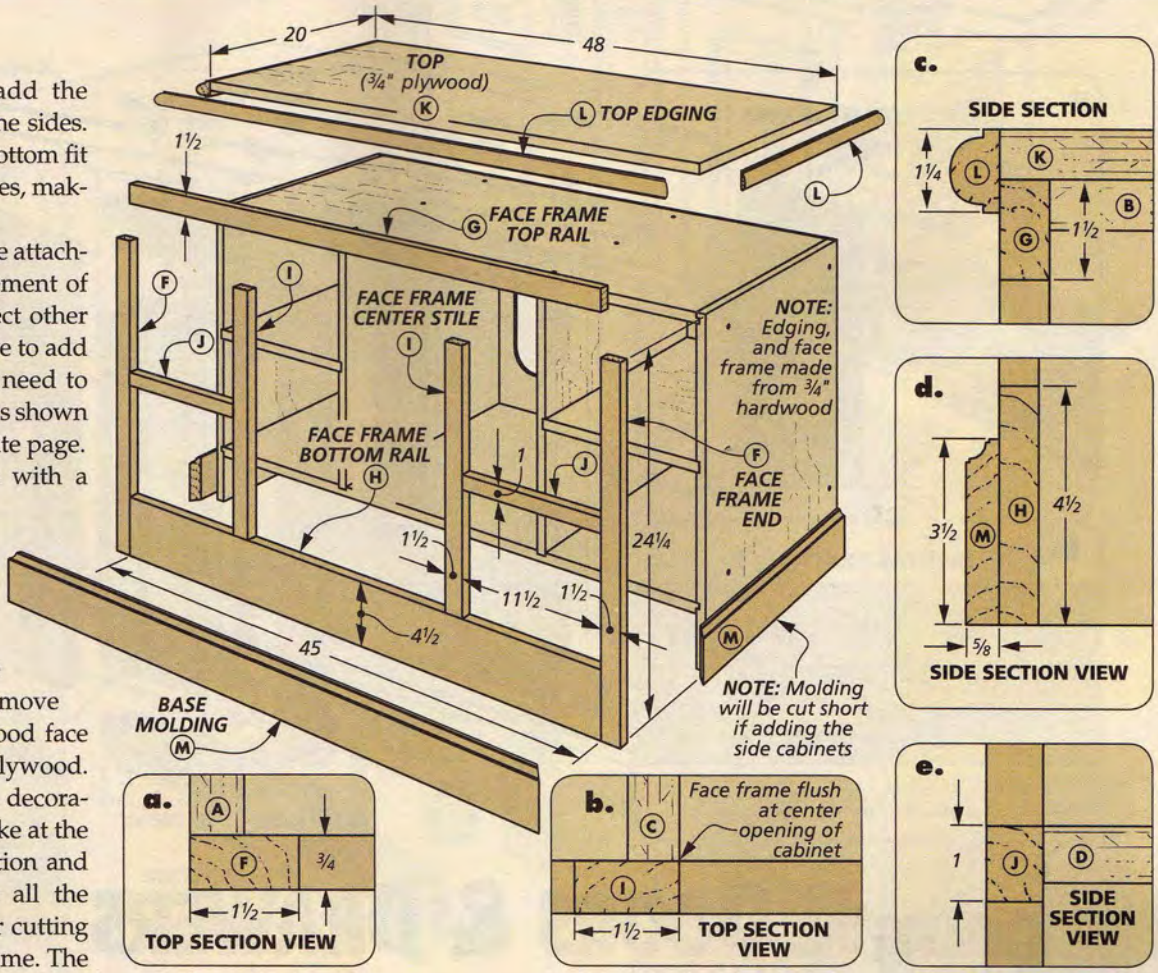
BACK. A plywood back with a cutout for ventilation completes the case. The back adds stability to the case and attaches with screws.

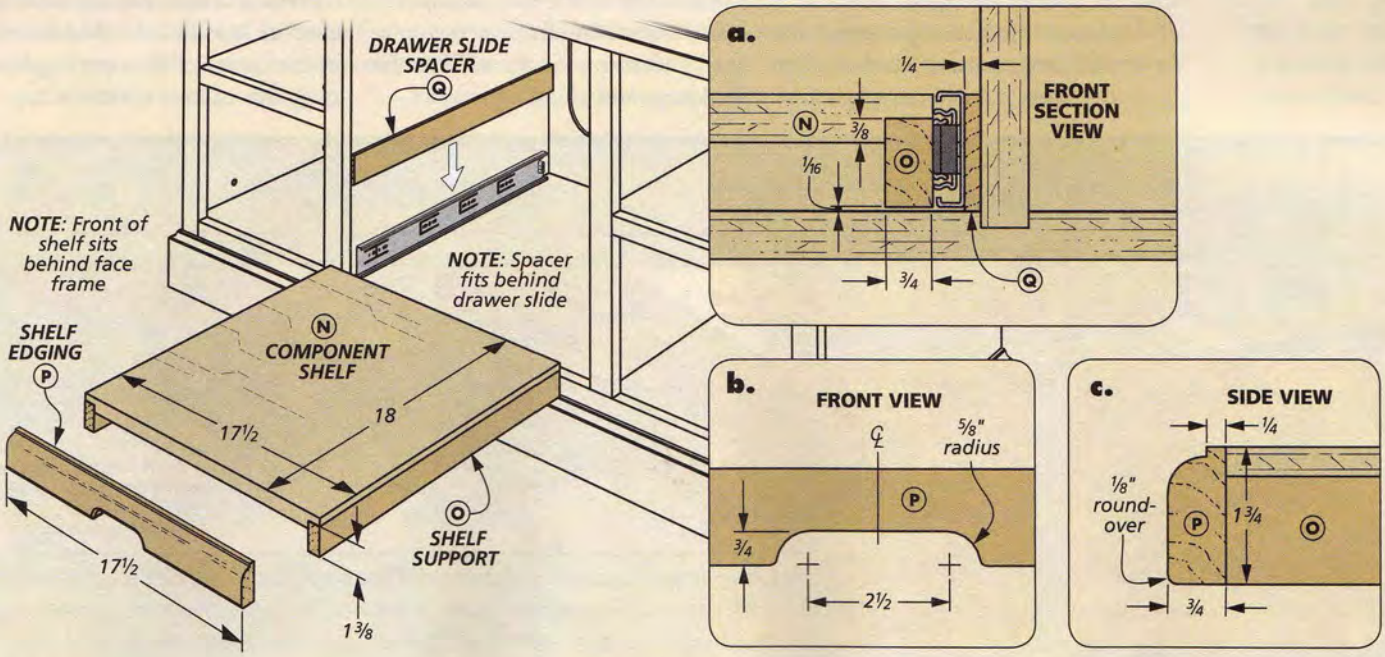
FACE FRAME. With the case complete, you can move on to adding the hardwood face frame that covers the plywood. You'll finish with some decorative molding you can make at the router table. The illustration and details at right provide all the information you need for cutting and attaching the face frame. The pieces are simply cut to size and glued to the case.

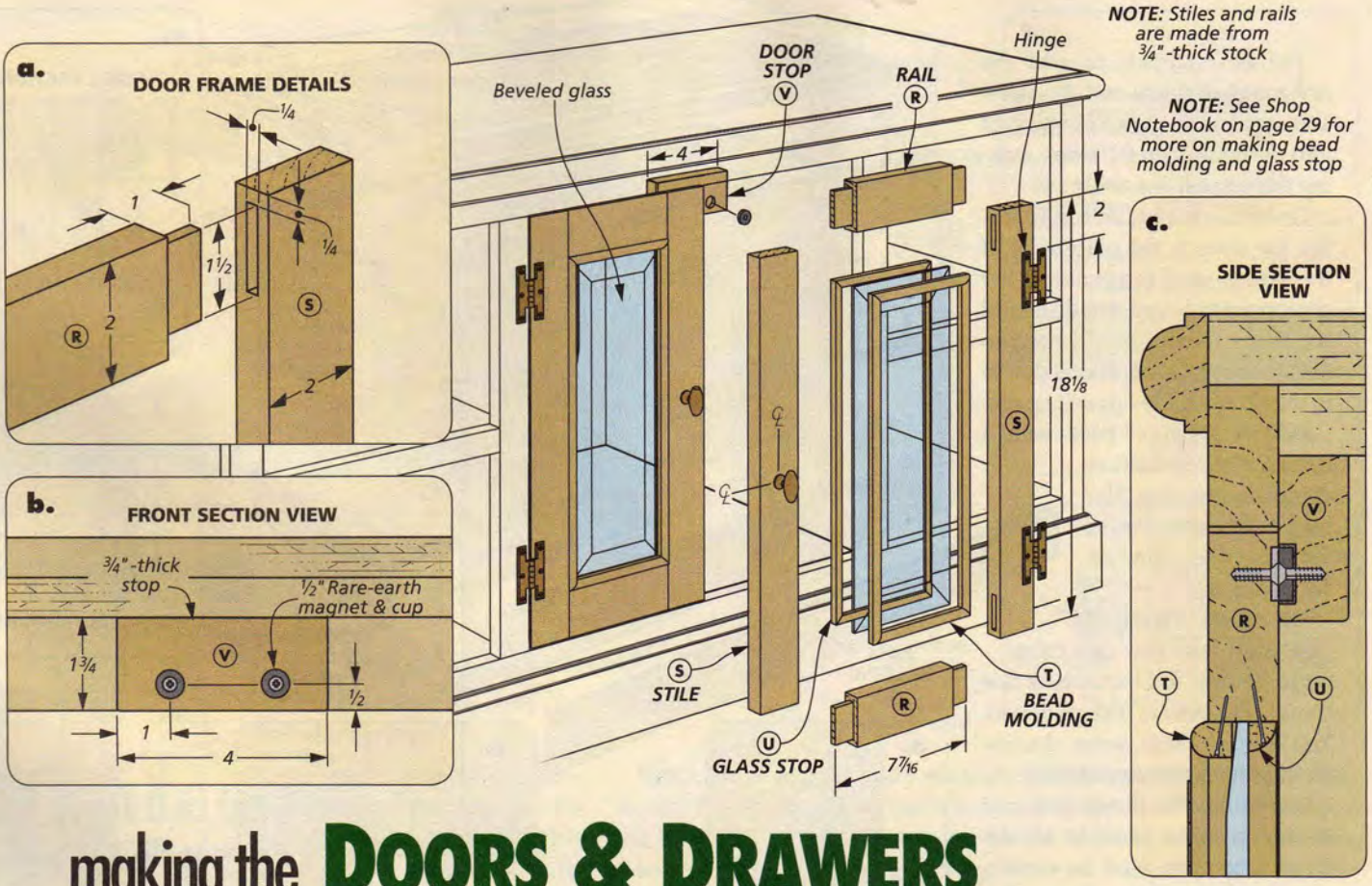
BOTTOM MOLDING. The decorative base molding adds a classic look. You can see how to make the molding on the opposite page.

ADD THE TOP. A second plywood top wrapped with a routed molding adds strength to the case. The technique for making this molding can be found in Shop Notebook on page 29. Note: If you build the entire media center, this molding stops short on the sides.

COMPONENT SHELF. To make it easier to access the components, a pull-out shelf on full-extension drawer slides fits into the center of the base. The drawings below show how the shelf is assembled. As you can see, the front edging on the shelf has a cutout for a hand hold and a routed profile. Another thing to note is the ¼"-thick spacers I used to mount the drawer slides. They allow the shelf to clear the doors when pulled out. Now you're ready to add the doors and drawers.







making the DOORS & DRAWERS

A pair of frame and panel doors and four drawers complete the base cabinet. Together they give the piece an elegant look and provide useful storage for the things you'll want to keep close at hand.

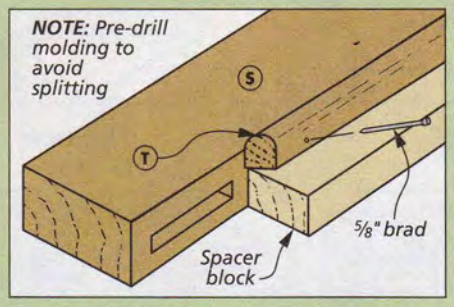
BEVELED GLASS DOORS. Since the center compartment of the cabinet is designed to house electronic gear, I decided to use glass doors so I could control the components with an infrared remote control. But rather than having the glass rest in a channel in the rails and stiles, I attached stops on both sides of the glass with brads. The advantage of this is a tighter fit of the glass which results in less rattling.

RAILS & STILES. I started by cutting the rails and stiles to size. Then I cut mortises in the stiles and matching tenons on the rails. Detail 'a' shows the exact fit of the two door parts. After assembling the frame, you're ready to move on to adding the moldings and glass.

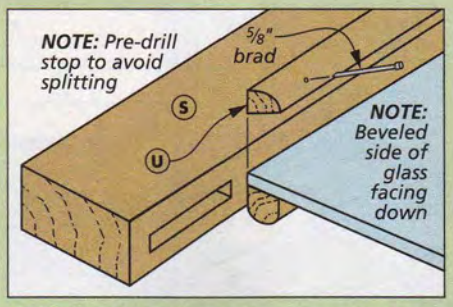
BEAD MOLDING & GLASS STOPS. Bead molding mitered around the outside and quarter-round molding on the inside serve as stops for the glass. You can find out more about making them both in Shop Notebook on page 29. The box below shows how to attach them.

HINGES & DOOR CATCH. I chose surface-mounted hinges for the look and ease of installation. A door stop in the center of the opening holds magnetic catches (detail 'b').

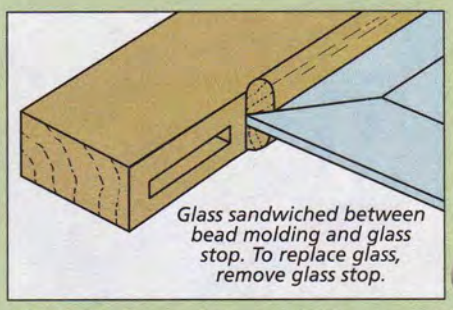
How-To: Install Glass Stops



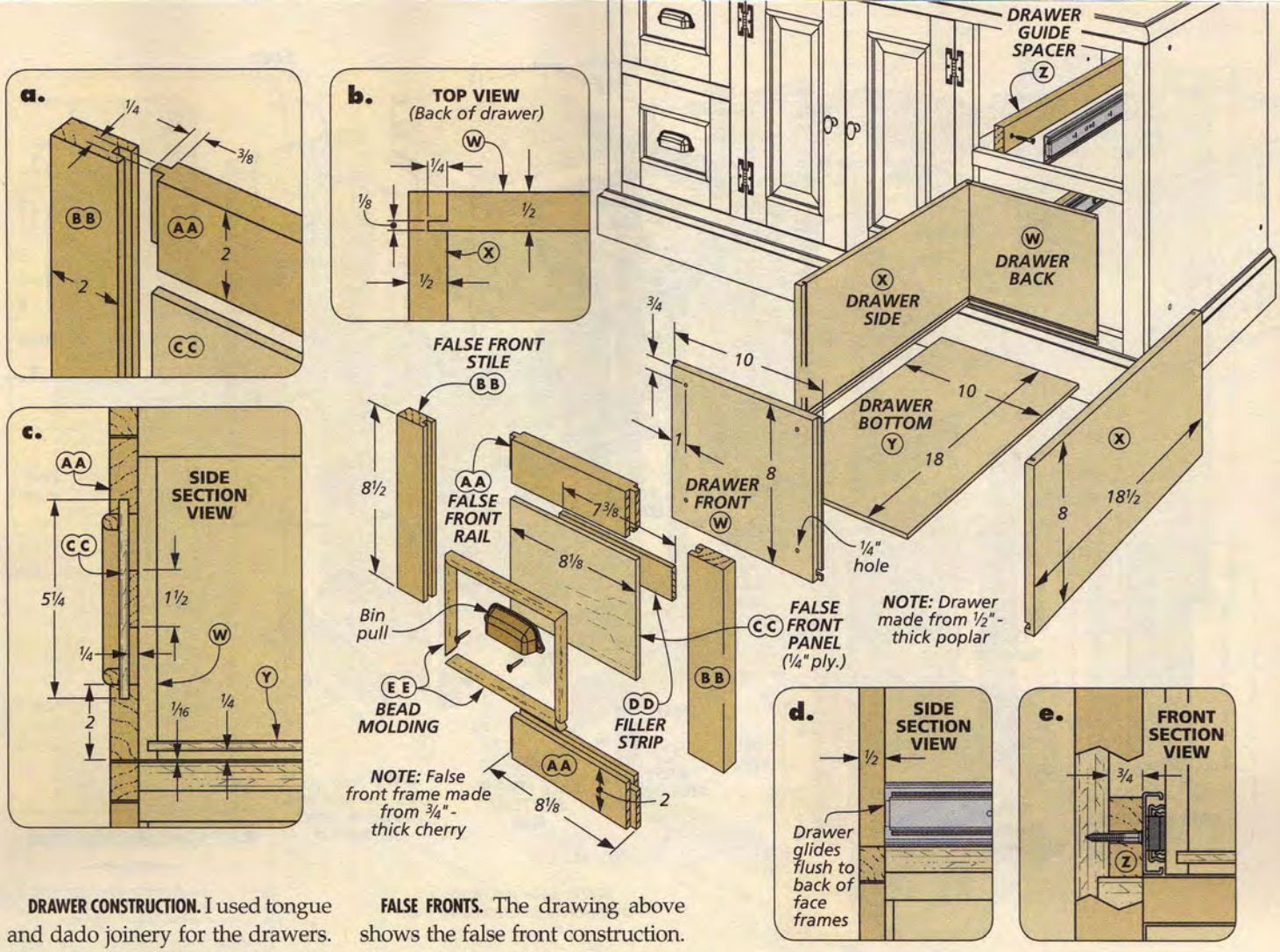
Bead Molding First. *Use a spacer to support the bead molding in position and attach the molding with brads.*



Add the Glass Stop. *Now turn the frame over, insert the glass, and attach the quarter-round glass stop with brads.*



Finished Look. *This method not only provides an attractive look, but allows for easy replacement of the glass.*



DRAWER CONSTRUCTION. I used tongue and dado joinery for the drawers. You can't beat this technique for simplicity and strength. You can start by cutting the dado on the sides at the table saw. Then it's just a matter of cutting a matching tongue on the front and back pieces to complete the joint (detail 'b'). A groove near the lower edge of the front, back, and sides holds the plywood bottom. Now you can assemble the drawers.

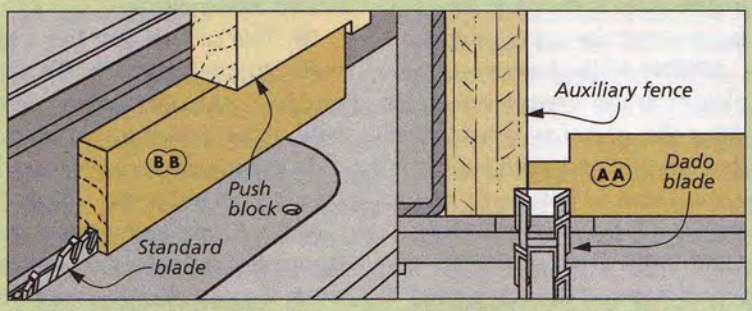
FALSE FRONTS. The drawing above shows the false front construction. It's nothing more than a frame and panel with bead molding mitered around the inside of the frame. I used stub tenon and groove joinery for the rails and stiles (box below).

After cutting the joinery for the rails and stiles, cut the panels to size and assemble the false front. You'll want to add a 1/4"-thick filler strip behind the panel to make it easier to attach the drawer pulls.

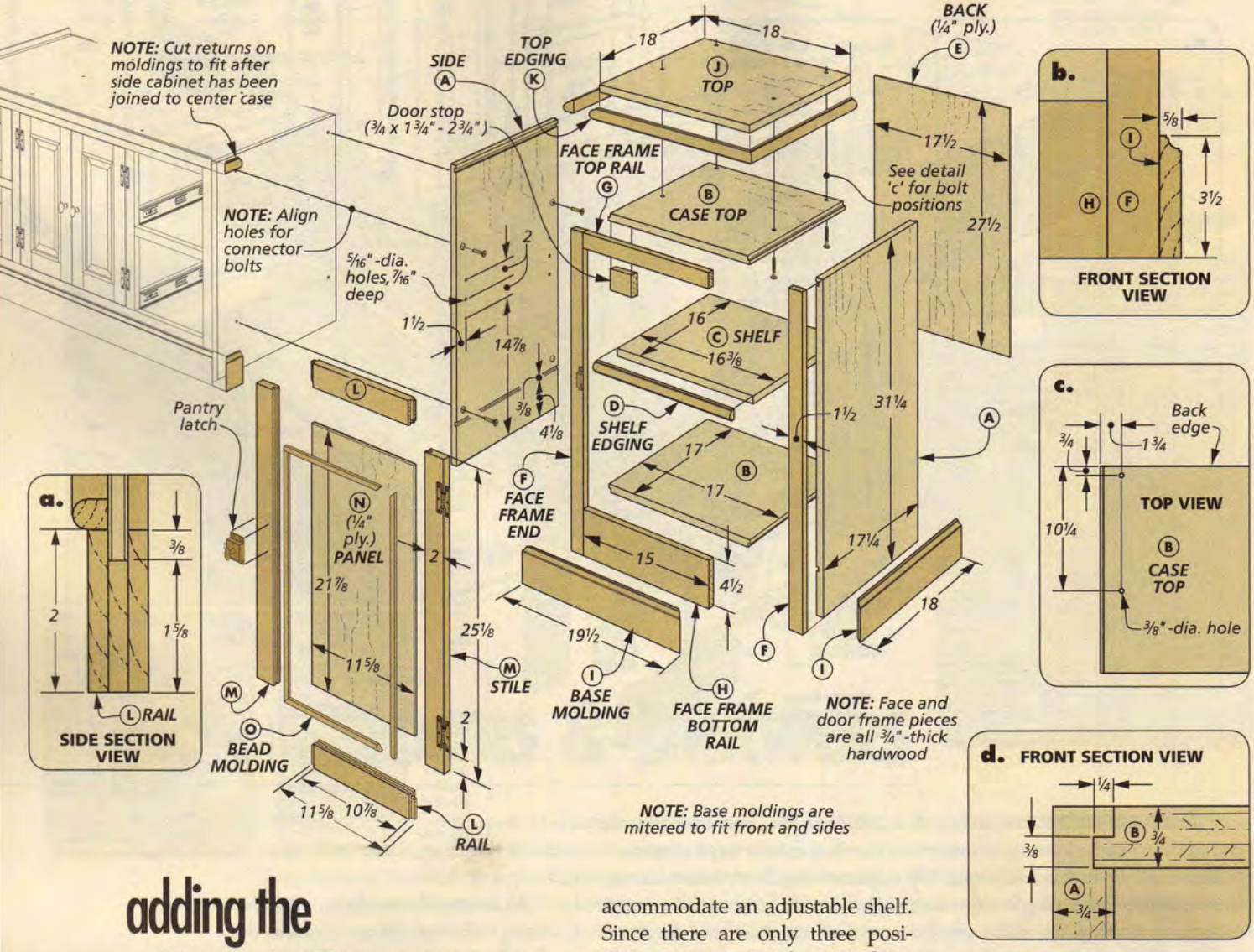
Now you're ready to add the bead molding. All you need to do is miter it to fit and glue it in place. Then add the pulls and the drawer slides to complete the base cabinet. The photo below shows how well it works as a stand-alone unit. But if you want to build the rest of the entertainment center, that story begins on the next page.

▼ The base cabinet stands on its own as a great addition to any room.

Stub Tenon & Groove



Getting a Tight Fit. *Cut the groove, then flip the workpiece end-for-end and repeat to center the groove on the edge. Then raise the blade in small increments to sneak up on a tight fit for the tenon.*



adding the SIDE CABINETS

After assembling the center base cabinet, building the remaining cabinets that complete the media center isn't at all difficult. The construction methods and techniques used before are also employed throughout the remaining pieces. So, as I go through the process, I'll focus more on the differences in the components rather than explaining the familiar tasks over again.

On each side of the center base cabinet is a tower consisting of two separate cabinets — a base and an upper cabinet. You can get started by building the base.

SIDES. In addition to the dadoes that hold the top and bottom and the rabbet for the back panel, the sides also have a series of holes to accommodate an adjustable shelf. Since there are only three positions, you can just lay out these holes using a square and drill them at the drill press.

TOP, BOTTOM, & SHELF. The case top and bottom each need a tongue on the ends to fit into the dadoes on the sides. A dado blade and an auxiliary fence on the table saw make quick work of these cuts. The shelf is simply edged with hardwood trim you make on the router table. One thing of note is that you'll need to drill holes as shown in the drawing to attach the upper cabinet.

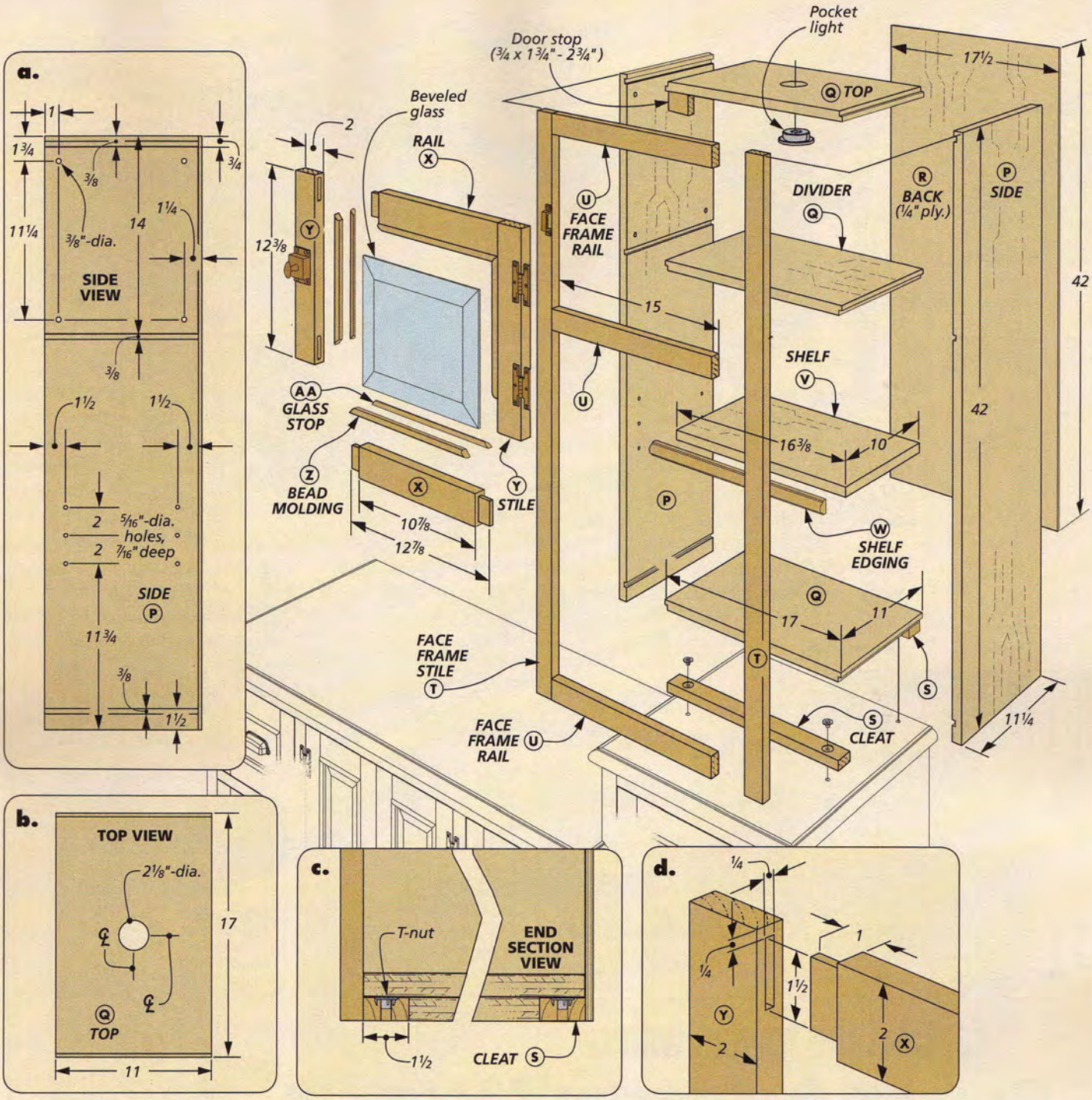
ASSEMBLY. With these parts complete, you can assemble the case. After the glue has dried, attach the plywood back with screws. It's a good idea to test the fit of your shelf at this point as well.

FACE FRAME. Once again, the plywood edges of the case need to be covered and simple hardwood face frame fills the bill. Starting with the end pieces gives you the chance to take an exact measurement for the remaining pieces and ensure a tight fit.

BASE MOLDING. The base molding matches that on the center cabinet, providing continuity throughout the different pieces. The thing to remember here is that base molding will only be attached to the outside of the cabinet. The side that attaches to the center cabinet has no base molding.

TOP. This cabinet also has a plywood top wrapped in the same molding you used on the center base. After mitering the molding to fit the panel, attach the top with screws from inside the cabinet.

DOORS. A frame and panel door completes the base. And because these doors have plywood panels, I chose to use stub tenon and groove joinery. After assembly, you can add bead molding, mitered



to fit inside the frame. Add the hinges, latch, and the door stop and you're ready to move on to the upper cabinets.

UPPER CABINETS

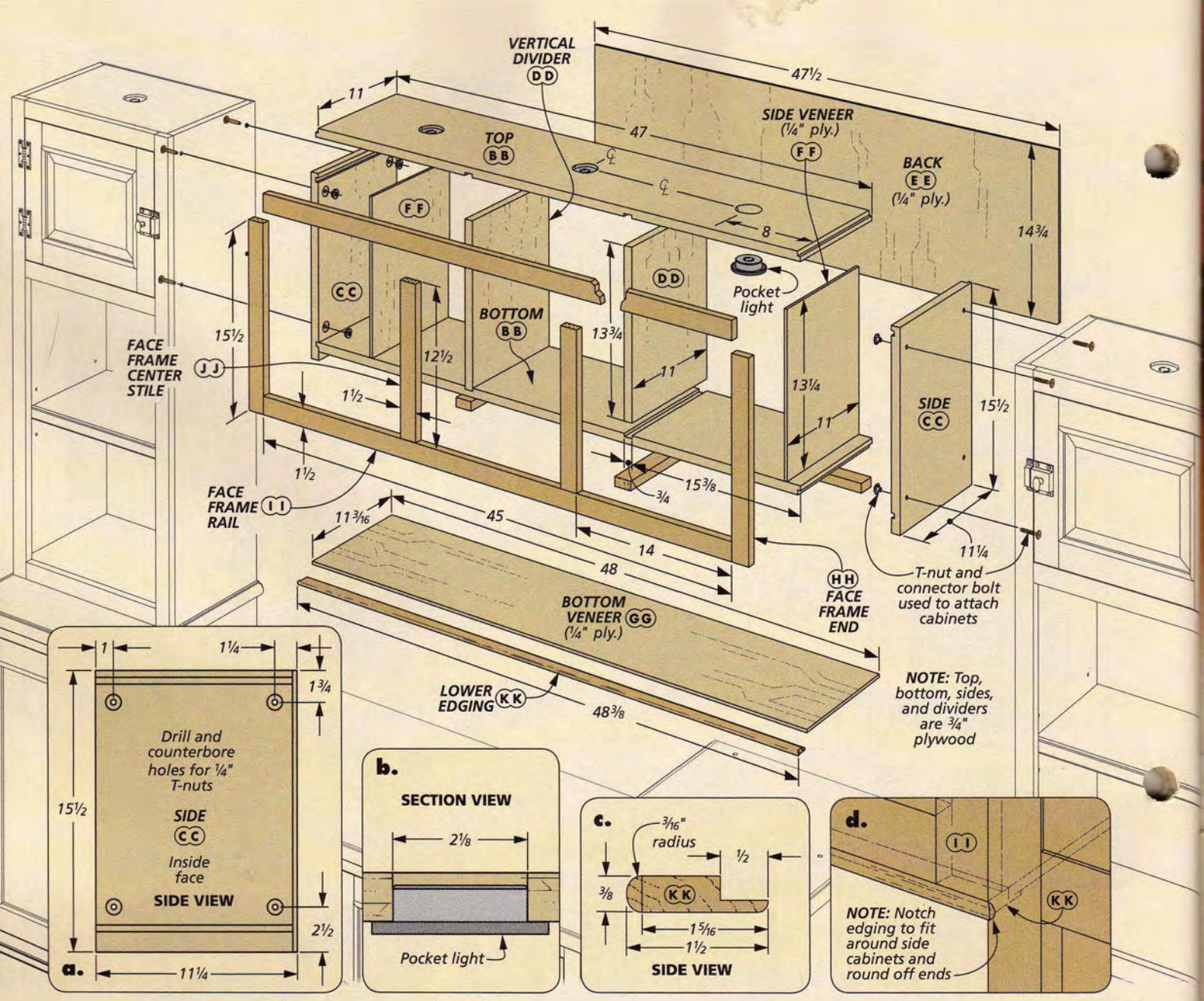
The upper cabinets feature a divider and an adjustable shelf. A glass panel door encloses the lighted interior of the top recess. You'll also add cleats with T-nuts underneath to fasten the cabinet to the base.

CONSTRUCTION TECHNIQUES. By now, you have a pretty good idea how the cabinet assembly works. Just follow the same process starting with the sides, the top and bottom, and the divider. Detail 'a' shows where to position the holes for the adjustable shelf. The face frame follows the same pattern.

A COUPLE OF DIFFERENCES. Unlike the other cabinets you've built up to this point, the top of this one needs to be drilled for the pocket light. Detail 'b' shows the diameter and placement for the hole.

I added cleats to the underside of the cabinets to attach to the base. T-nuts fit into holes in the cleats, allowing you to use connector bolts from inside the bottom cabinet to provide a strong, stable connection. Detail 'c' has all the information you'll need.

FACE FRAME & DOOR. There's nothing unusual about adding the face frame to this cabinet. It's the same process that you used before. The door is also built the same way as the one on the center base cabinet, only the size is different. The joinery and the method for using glass stops and bead molding to hold the glass is also the same. When you're finished, you can move on to building the bridge that connects the two upper cabinets.



connect the towers with a BRIDGE & CROWN MOLDING

The last component of the modular media center is the bridge cabinet that spans the two towers. In addition to giving the piece a more finished look, the bridge contains a bank of lights, making it an ideal display cabinet. And once again, the construction is similar to everything you've done so far.

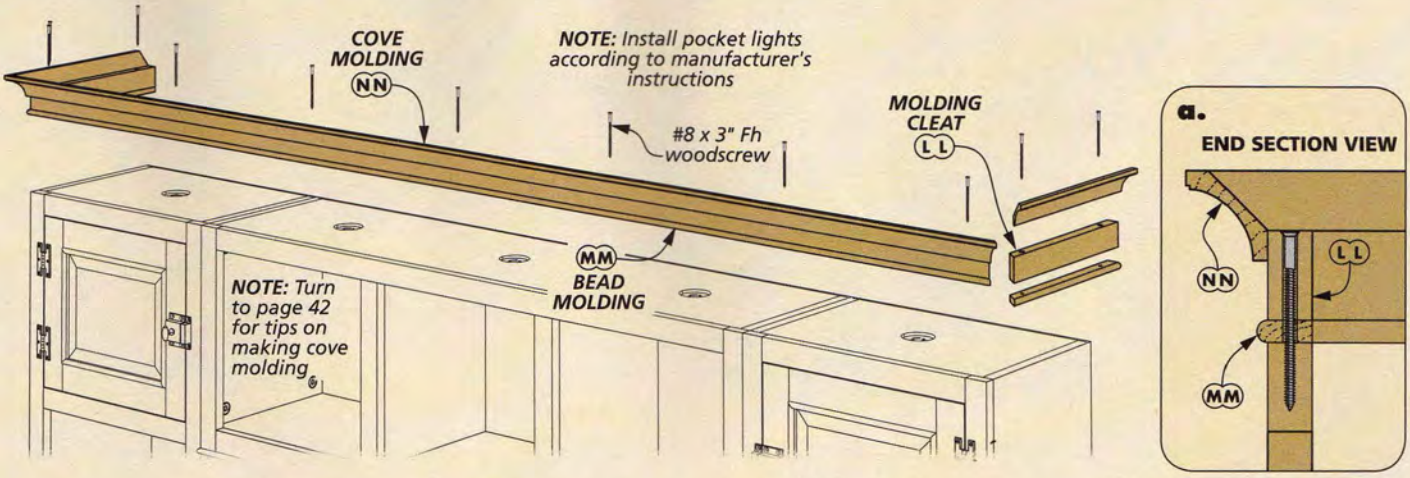
SIDES. One of the first differences you'll notice in the bridge is the holes in the sides for T-nuts. You can drill these at the locations shown in the drawings above.

Rather than leaving the T-nuts exposed, I added a veneer of ¼" plywood to cover them up. Before assembling the case you can add the veneer with just a little glue on the plywood and a few cauls to clamp them up. You'll use connector bolts in the upper cabinets to lock the bridge in position.

LIGHTS. Like the upper cabinets, the bridge also has lights in the top. You can see how they're positioned in the case in the main drawing above. It's a simple task to drill holes for them using a large Forstner bit on the drill press.

Sources on page 51 has information on where you can find the lights and other hardware. You'll find instructions for wiring the lights included in the package.

FALSE BOTTOM. I didn't want to leave the underside of the bridge exposed, so I attached cleats to the bottom and covered them with a piece of ¼" plywood. A section of bead molding along the edge finishes it off (detail 'c').



CROWN MOLDING. To tie the components together and complete the media center, I added built-up crown molding to the top. You can see how the pieces all fit together in the drawings above.

I started by gluing bead molding to a hardwood cleat. Then you can attach the cleat to the top of the three cabinets with screws. The cleat and bead molding span the width of the pieces and provide a foundation for attaching the cove molding (detail 'a'). After mitering the pieces to fit, the cove molding is glued to the cleats.

You can purchase cove molding or make your own at the table saw. The advantage of making your own is that you're more likely to get a good color and grain match of the hardwood you've used for the rest of the project. The article on page 42 will walk you through the process.

PUT IT ALL TOGETHER. After finishing the individual components, you can connect the cabinets using bolts. The illustrations below will help you out during this final assembly.

Now you can plug in the TV and relax. No doubt this media center will be a treasured piece of furniture for years to come. W

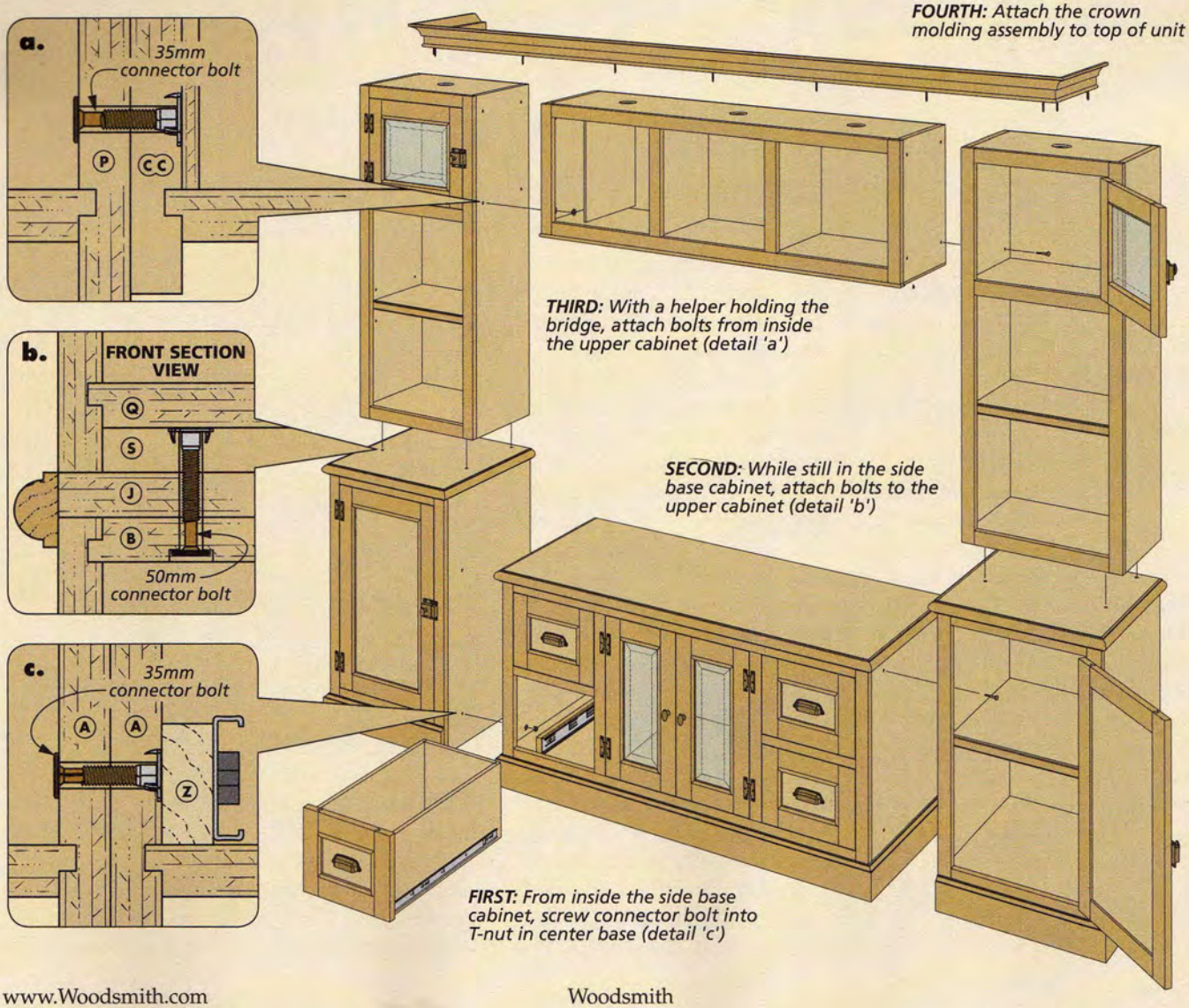


table saw Cove Molding

You don't have to settle for "off the shelf" cove molding. How about great-looking, custom cove molding "off the table saw?"

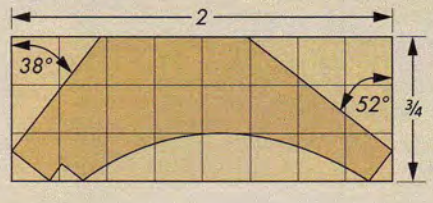
Making cove molding, like that used on the media center on page 30, has always been one of my favorite table saw techniques. You get to use the saw in such a different and interesting way — first to create the shallow cove profile and then to add the simple bevels that give the molding its unique shape and fit. The real kicker is that you end up with a custom molding that's a perfect match to the other wood in the project and is just as well made as the cove you'll find at the lumber store (photo in the opposite margin).

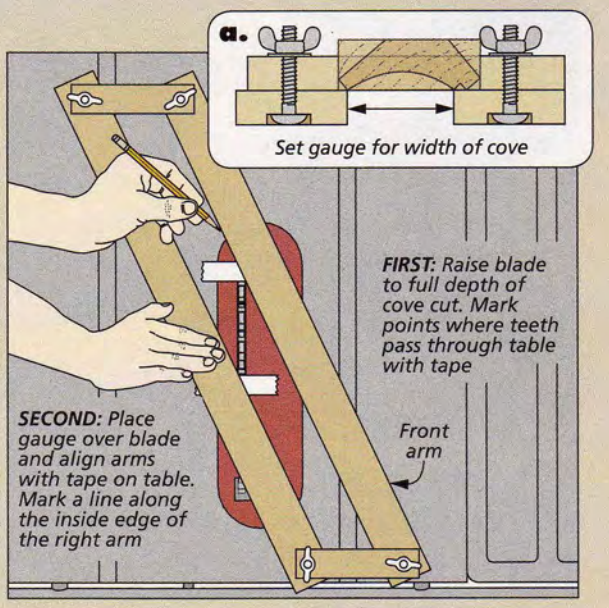
If this doesn't persuade you, let me add one more enticement. The technique is very easy to master. All it takes is careful setup, and a little patience.

THE TABLE SAW TWO-STEP. The table saw setups shown in the drawings are specific to making the cove molding needed for the entertainment center. But the same steps and techniques apply to any size and shape of cove you may need for a project.

Making cove on the table saw involves two distinct operations. You start by cutting a cove profile in one face of a properly sized blank. Then, to turn the hollowed blank into cove molding, you make a series of bevel cuts.

Use the full-size pattern below to draw a layout on the ends of the cove blanks.





THE COVE SETUP. Cutting a cove profile on the table saw definitely isn't "run-of-the-mill." Take a look at the photo above and you'll see how it works. The trick is to push the blank across the blade at an angle. This angled feed results in a hollow or cove-shaped cut. You can change the width and depth of the profile by

varying the feed angle along with the final height of the blade.

Once the blanks have been sized and the profile laid out on one end, you can set up the saw for the cove cuts. As shown at right, the angled feed is controlled by sandwiching the blank between two auxiliary fences clamped to the saw table.

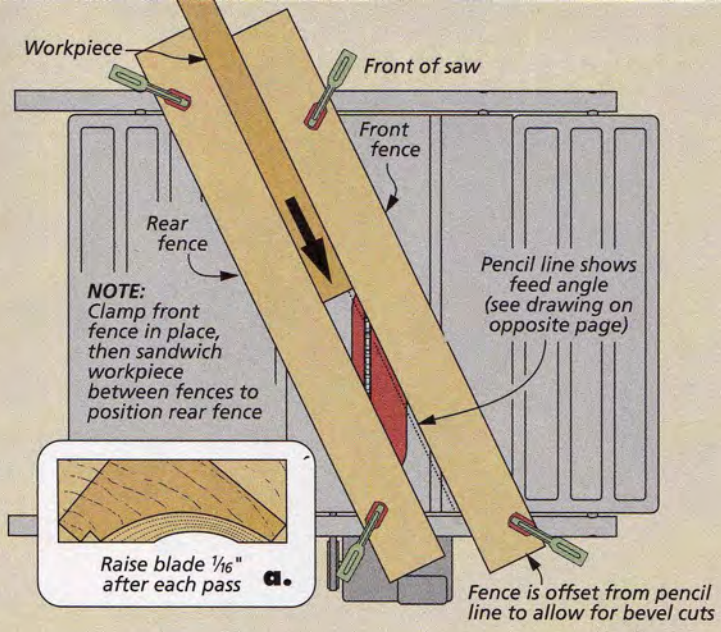
The key is finding the fence angle that produces the desired profile. The drawing on the opposite page shows how to use a shop-made parallelogram gauge to do this. The saw blade is raised to match the cove depth and the gauge is adjusted to the width of the cove. Then position it over the blade to find the feed angle and mark it with a pencil line. Note that when you position the fences, you need to allow for the bevels at the edges of the blank (right drawing).

MAKING THE COVE CUTS. After clamping the fences in position, the cove cuts that follow are pretty straightforward. The key is to take multiple shallow cuts — not more than 1/16" at a time. You should be able to feed the blank without much resistance. If not, you're probably taking too deep a bite.

As the cove profile starts to take shape on the end of the blank, it may not be centered in the layout. Don't be concerned — this is normal. When the cove is cut to full depth, the profile will follow the layout line.

RIDGES. You'll also notice a series of fine ridges on the surface of the cove cut left by the saw blade. This is unavoidable, but there are a couple of things you can do to minimize it and create a surface that requires less sanding.

My first suggestion is to use a rip blade. Its flat-ground teeth leave fewer and finer ridges. And then keep in mind that the final pass over the blade is the clincher. So make this a very light cut (1/32" or less) while concentrating on a slow and steady feed rate.



I like to stop just a hair shy of the layout line and complete the cove profile with sandpaper and a sanding block. You'll find a tip to help with this on page 28. Then it's back to the table saw to complete the job, as shown below. This is the part I really anticipate. I get a pleasant sense of accomplishment as my custom cove molding comes from the saw looking factory made. W

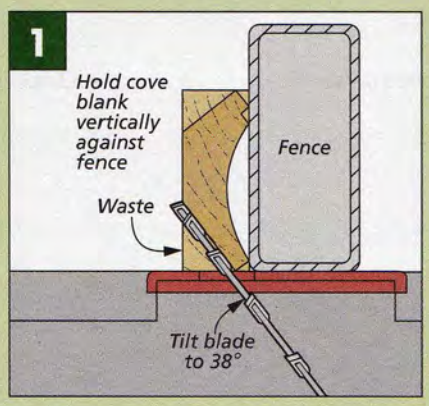
▼ A little time at the table saw is all it takes to make great-looking cove molding.

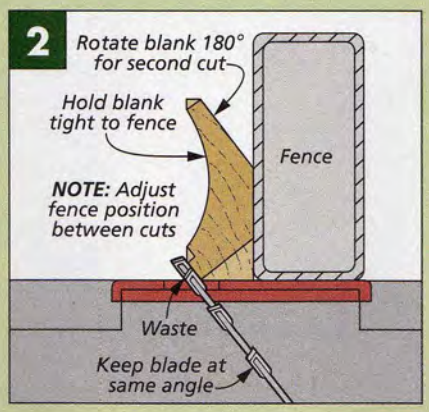
How-To: Complete the Molding

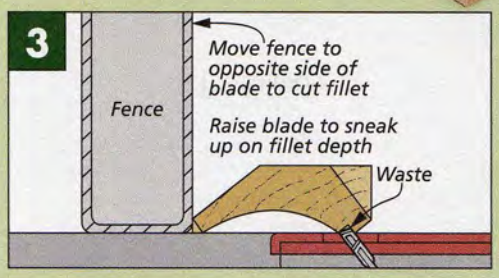
Making the series of bevel cuts that transforms the cove blank into a useful piece of cove molding is a lot easier than you might imagine. The goal is to cut complementary bevels that form 90° corners at the top, bottom, and back of the molding. This is what makes the cove look and fit right.

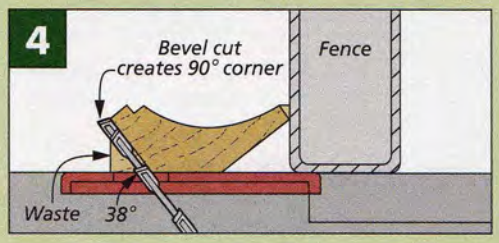
ONE ANGLE. The two complementary angles you need for this particular molding are 38° and 52°. But when you take a look at the drawings at right, you'll see that all the bevel cuts can be made using only one blade tilt angle and a final 90° cut.

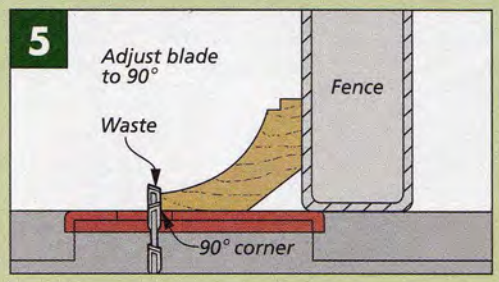
The trick is to make the first two bevel cuts with the cove blank held vertically against the rip fence, as in Figures 1 and 2. Then you'll move the fence to the opposite side of the blade for the shallow fillet cut (Figure 3). After repositioning the fence, the third bevel is cut with the blank flat on the table (Figure 4). Finally, adjust the blade to 90° for the last cut (Figure 5).











make perfect

Tenons on the Router Table

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For construction details on the guide shown above, visit our website at Woodsmith.com.

When you need tenons with crisp, straight shoulders and perfectly clean cheeks, take the job to the router table.

There are a number of ways to cut tenons — a dado blade or a standard blade on the table saw, or even a band saw, to name a few. But when I want tenons with perfectly clean, crisp shoulders and cheeks, you'll usually find me settled in at the router table. The results can't be matched by any other method.

WHEN AND WHY. Unlike a saw blade, a sharp router bit can create perfectly smooth tenon cheeks and shoulders. So whenever the joinery will be exposed, such as in a bridle joint or a through tenon (even half-laps), a tenon made on the router table can be the best choice.

Another plus is that in many instances, the setup is quicker and sometimes a little more user-friendly than the table saw. There's no dado blade changeover or tenoning jig setup to worry about. You simply install a straight bit in the router table and you're ready to go.

▼ A large, sharp straight bit creates perfect tenons.

THE ESSENTIALS. There are only three basic necessities for router table tenons. The first is a sharp straight bit you'll use to remove the waste. A large-diameter bit will get the job done quicker. I have a ½"-shank, 1"-dia. bit that I reserve for this purpose (photo in left margin).

Next, the router table fence is set as a stop to gauge the length of the tenon. The fence should provide a smooth surface for the end of the workpiece to slide along. A fence with an adjustable bit opening or an auxiliary fence works well.

Finally, you need an effective way to hold the workpiece square to the fence as you feed it across the bit. Rather than use a miter gauge, I rely on a simple right angle guide that slides along the fence (main photo above). This arrangement gives you much better control and it guarantees the workpiece will always be square to the fence.

BACK UP. The guide also serves another important purpose. When routing the tenon, you're working across the grain and chipout at the trailing edge of the workpiece is a danger. My solution is to provide support at the edge with a slip-in, replaceable backup fence.

ROUTING TENONS

That's all you need to get the job done. With the bit installed in the router and the guide at hand, you're ready to go.

IN THE BALLPARK. You'll start by making a preliminary adjustment of the bit height and fence position.

Then each adjustment is refined with test cuts to produce a dead-on accurate tenon.

A combination square will help you with both adjustments. The bit height is set a little low and the fence is placed a tad close. I never try to hit these settings on my first attempt. So be conservative. The idea is to leave some room to sneak up on the final settings.

ZERO IN. Once the initial settings are complete, the next step is to zero in on the final bit height with test cuts, as shown in Figures 1 and 2. Using the guide, make a cut across the tip of both faces of the workpiece. Be sure to press down firmly as you make the cuts. As a rule, I always make a second "insurance pass" on each side once the bulk of the waste has been removed by the initial pass.

Check the fit of the "stub" to the mortise and then tweak the bit height accordingly. Since you're removing material from both sides of the tenon, the height adjustment is doubled. So I always make very small adjustments.

WORK BACK. Once the bit height is fixed and the thickness of the tenon is established, you can start removing the waste back toward the shoulder line. The best way to get the job done is with multiple, light cuts. Nibble away the waste on one cheek until the end of the tenon contacts the fence. Then flip the workpiece over and repeat the process on the opposite cheek.

Keep the workpiece flat on the table and maintain steady downward pressure as you make the cuts. The workpiece should be held firmly against the guide to avoid chipout. This is how you'll get perfectly smooth tenon cheeks.

ADJUST THE FENCE. I like to cut all my tenons to rough length at this point, and then fine-tune the fence setting. This guarantees that the final shoulder cut on all the pieces will be very light and easy.

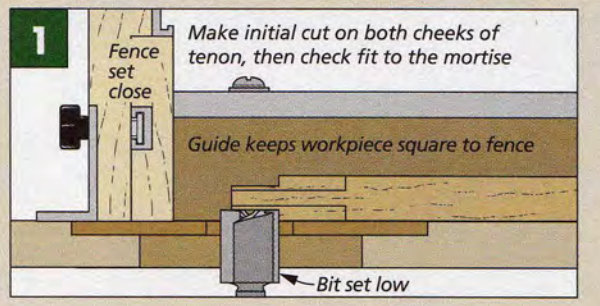
My initial fence adjustment usually leaves me only about 1/16" or less of waste to remove at the shoulder. And as with the bit height, to hit the final shoulder line, you want to make very fine adjustments of the fence between cuts.

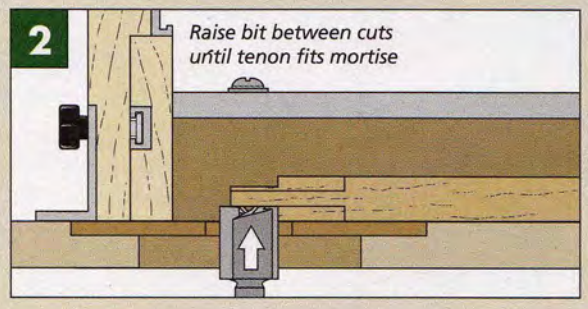
STEADY FEED. It's tempting to slow the feed to avoid the possibility of chipout at the trailing edge. But a slow feed rate can lead to burning at the shoulder. Keep the workpiece moving steadily and trust the backup fence to control chipout.

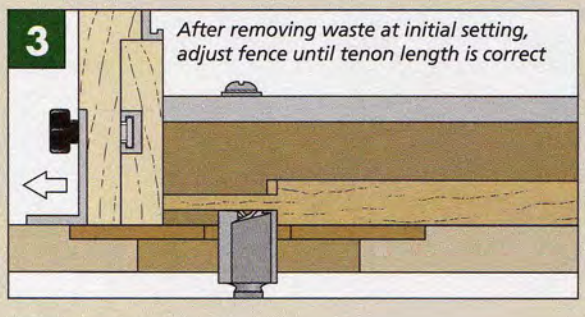
It's a good practice to make two passes at the final shoulder line — one to remove the remaining waste and a second to be certain the shoulders on both faces of the tenon are cut to full depth.

SHORT SHOULDERS. For a tenon with four shoulders (edge shoulders), you can follow the same procedure. As when routing the cheeks, work back from the tip of the tenon toward the shoulder. Use a light pressure for the final shoulder cut. You want to avoid chipping or scoring the long shoulder.

As with any joint, the proof is in the pudding. And I'm never disappointed when I slip the tenon into its mortise for a seamless fit. W



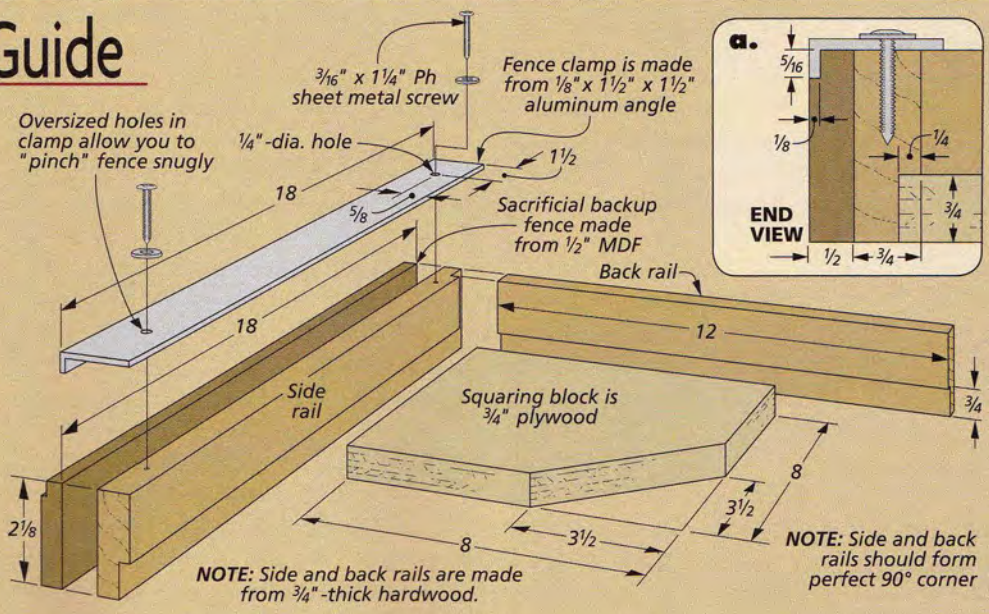




How-To: Tenon Guide

As you see at right, building the tenon guide is pretty straightforward. The main assembly consists of two hardwood rails and a plywood squaring block. The rails are joined at the corner with a rabbet and then rabbeted along the lower edge to accept the squaring block.

The backup fence clamp is made from a piece of aluminum angle. One side is cut down to create a lip that captures a rabbet on the backup fence. The clamp is attached through oversized holes that allow you to snugly pinch the fence.



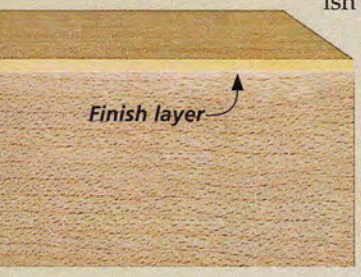
applying Resin Finishes

A resin finish will protect the wood from wear and tear and give your projects the look of multiple coats of varnish.

If you're looking for an impervious wood finish that hardens quickly and covers in one coat, a resin finish may be the coating you want to use. This is a two-part finish that's mixed together from epoxy resin and a hardener.

Since it hardens through a chemical reaction, rather than curing through evaporation, you can pour the finish on in a thick layer. As a result, you get a finish that looks like a layer of acrylic. But it cures in just a few hours.

▼ Resin finish can be applied up to ⅛" thick to create a tough, durable finish.



MEASURING AND MIXING

Half the work of using a resin finish is in preparation. For this reason, I like to gather all the necessary items in one area before starting.

TOOLS. You'll need three containers for measuring and mixing, several stirring sticks, and a disposable putty knife. I like to protect the work area with some paper or plastic. Finally, placing tape around the edge of the workpiece creates a dam. This will keep the finish from running down the sides or collecting on the bottom.

BE METICULOUS. The key to a successful finish is equal proportions, so be sure to measure both ingredients accurately. I use disposable measuring cups to measure equal parts of resin and hardener.

AVOID BUBBLES. One of the pitfalls of a resin finish is bubbles that form in mixing and pouring. To keep the bubbles to a minimum, pour the resin slowly down the side of the measuring cup. Using a wooden stirring stick, gently fold the resin into the hardener. The trick here is to avoid stirring air into the finish (see box at right).

BE THOROUGH. To be certain that there is no hardener clinging to the sides of the cup, I transfer the mixture to a third cup and continue mixing. Hardener that is not mixed well into the resin will leave a filmy haze on top of the finish that can't be removed.

APPLYING THE FINISH

Once the epoxy is thoroughly mixed, you can pour it on the surface of the workpiece. The goal is to spread the resin out evenly, again without creating bubbles.

POUR IT ON. To pour, place the lip of the container on the surface of the wood (main photo). Then push the finish to the edge with a plastic putty knife, forming a coat about ⅛" thick. Keep the putty knife in the resin as you work to avoid mixing air into the resin. The resin is self-leveling and will form a smooth surface on its own.

GETTING RID OF BUBBLES. Even though you've taken precautions to keep air out of the resin, you might see a few bubbles here and there in the finish. They can be brought

to the surface by applying carbon dioxide. There are two ways to do this. You can just blow on the bubbles until they pop. Or you can use a handheld propane torch. Hold the flame a few inches from the surface and fan it over the bubbles, keeping it moving (right photo).

CURING. The resin may take several hours to set up, depending on how thick it is. You might think that a thinner coat would cure more quickly, just like varnish. But that's not the case.

Epoxy resins, when combined with a chemical hardener, cure through a chemical reaction that generates heat. The thicker the coat of resin, the more heat it generates and the quicker it will harden. Even an ⅛"-thick finish will take up to four hours to harden. For this reason, you'll want to protect the finish from dust.

▲ Epoxy resin can also be used for mounting and preserving keepsake items.

To do this, I laid a piece of clean cardboard over the workpiece and propped it up above the surface on the sides. Small projects, like the plaque in the photo below, can be placed inside a box to protect them during the curing time.

POLISHING. But even with these precautions against dust, you may not get a flawless finish. If there's dust on the finish after it's cured, you can rub it out. To do this, I use a polishing glaze made for rubbing out an automotive finish.

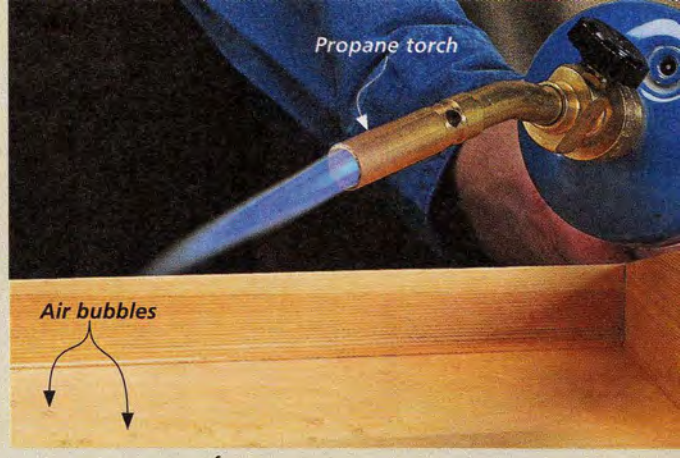
EDGE. Once the finish is cured, you can remove any tape from the edge. You may find a slight ridge on the edge, but you can sand this off. The finish also cuts well with a router bit, so it's easy to add a chamfer or roundover.

SATIN FINISH. Resin finishes produce a mirror-like, high-gloss surface. If you prefer a satin finish, buff the surface with steel wool or very fine sandpaper and then finish with a wax polish. You can use #0000 steel wool or 600-grit paper to dull the surface. Then buff it smooth with carnauba wax.

EMBEDDING. Resin finishes are not just an alternative to varnish or polyurethane. They can also be used to preserve keepsakes (left photo). Heavier objects, like metal can just be placed on the surface before the finish is poured over them. Lighter objects like paper or flowers, should be glued in place with white glue. And it's a good idea to do a test of the type of item you're embedding to make sure you don't get undesired results.

VERTICAL SURFACES. Resin finishes work best on flat surfaces. But you can apply them to vertical surfaces too. It will just take more time to apply. Use a paint brush and apply the resin in thin coats, the same as any finish. Make sure each coat is thoroughly dry before applying the next coat. You'll need to add several coats to build a thick film similar to the flat surface.

Resin finish may not be the first choice for all your projects, as it's a highly specialized finish. But it can be a good choice when you're looking for a tough, impenetrable finish that will last for years.



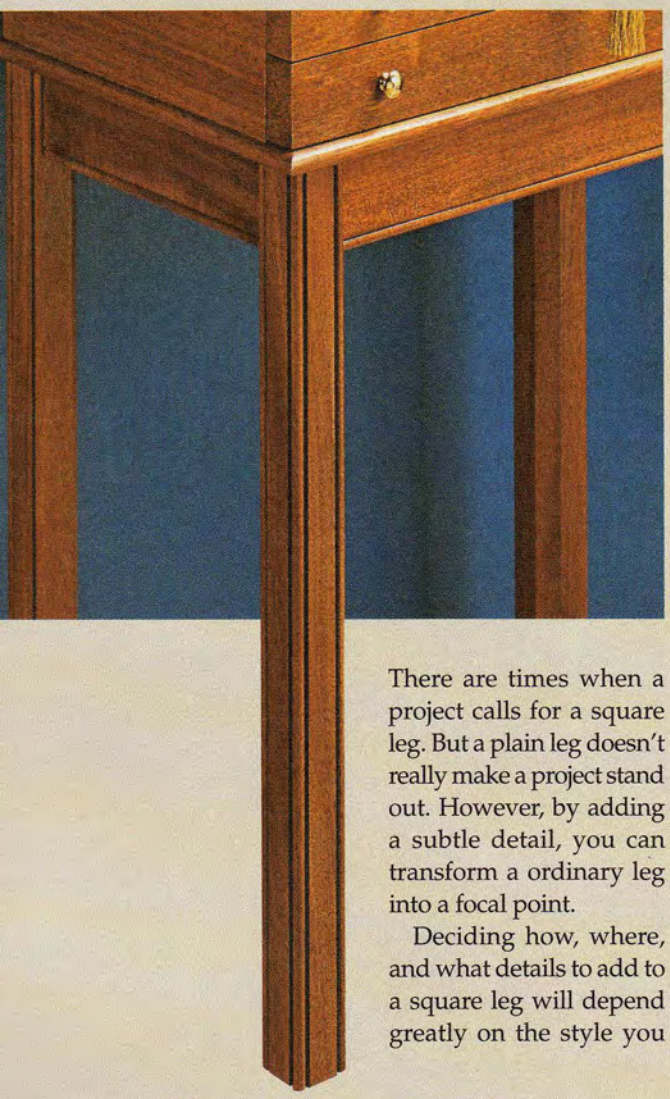
▲ Stubborn air bubbles can be removed by passing a propane torch over the surface before the resin cures.

How-To: Apply a Resin Finish

▲ Pour the resin down the side of the measuring cup into the hardener. This will reduce air in the mixture.

▲ Fold the resin into the hardener slowly, using a wooden stick, scraping the sides for a thorough mix.

▲ Spread the mixture evenly across the surface using a putty knife. Low spots will level out.



dressing up a Square Leg

A few cuts on the band saw or router table can transform a plain, square blank into a leg that adds to the style of the project.

There are times when a project calls for a square leg. But a plain leg doesn't really make a project stand out. However, by adding a subtle detail, you can transform a ordinary leg into a focal point.

Deciding how, where, and what details to add to a square leg will depend greatly on the style you want to convey in the completed project. Even minor details on a leg can dramatically change the appearance of the project.

DESIGN GUIDELINES

When adding a profile, keep in mind the size and design of the leg. Your goal here is to add detail without sacrificing the integrity of the leg. Plus, a design that is too busy can be distracting.

You'll also need to leave room on the leg for the joinery. Which means you may have to place a wider profile on the two adjacent sides that face out and leave the inside surfaces smooth. Or you may have to center the mortise on the leg.

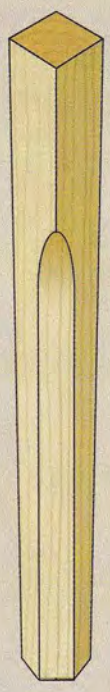
CHAMFERS AND TAPERS

Sometimes all that's needed to bring style to a leg is to visually lighten its appearance. You can do this by adding a chamfer or a few tapers at the table saw or router.

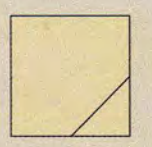
CHAMFER. A small chamfer on the edge of a square leg doesn't change the style much. But if you make the chamfer wider (say ½") on all four corners and stop it just below the table rails, then you give the table a traditional look.

An even wider chamfer on just the inside corner of the leg that stops at the apron lightens the look of a square leg (drawing at left).

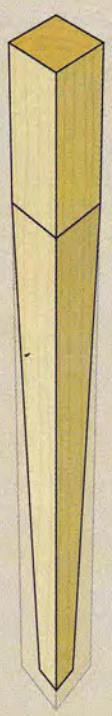
TAPERS. A taper on all four sides of a square leg has long been associated with Shaker design (center drawing at left). But adding two or four tapers to a leg can also reduce the heavy look of a square leg. When I add two tapers to a leg, I leave the outside faces straight and cut the tapers on the inside faces, as shown in the near drawing at left.



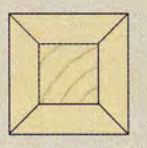
Chamfered Leg



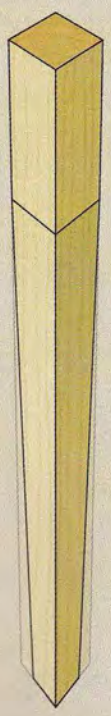
A large chamfer on the inside corner lightens the look of a square leg.



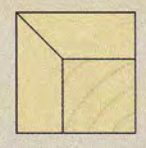
Four-sided Taper



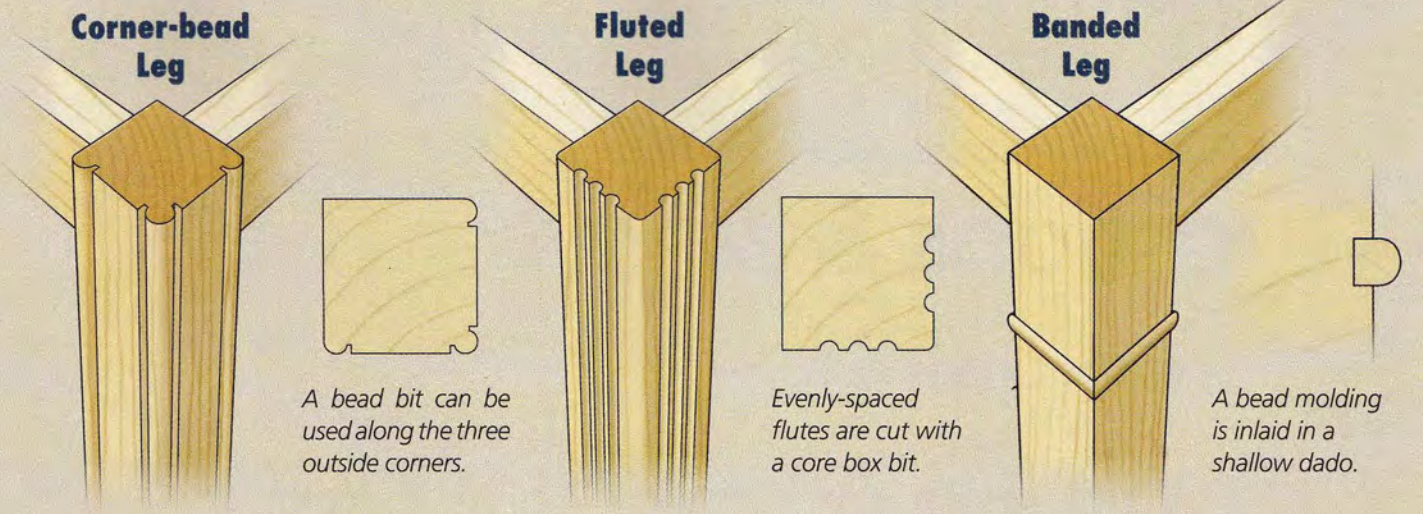
Equal tapers on four sides is a profile often seen in Shaker-style furniture.



Two-sided Taper



A taper on two sides gives the appearance that the leg flares outward.



A bead bit can be used along the three outside corners.

Evenly-spaced flutes are cut with a core box bit.

A bead molding is inlaid in a shallow dado.

Chamfers and tapers can be added in many ways to enhance the look of the project. But be careful not to remove so much material that the leg looks flimsy.

CHOOSING A PROFILE

Adding a routed detail to a square leg can influence the style of the project as well. A simple roundover might just be considered a relief. But more elaborate profiles will change the style.

FLUTES AND BEADS. Flutes and beads are found on many different styles of furniture. A single bead on the outer corners of a leg looks attractive as shown in the left drawing, above and main photo (opposite).

Double and triple flutes or beads also add detail (center drawing, above and box at right). But keep it simple. One side of the table leg may be enough, and no more than the two surfaces facing out.

BANDS. Adding horizontal bands like the one in the right drawing above will break up the long straight lines on the leg. You can rout or cut a flat-bottom dado in the leg. Adding a bead inlay band in the dado makes a small, but dramatic difference in the style.

ADDING A FOOT

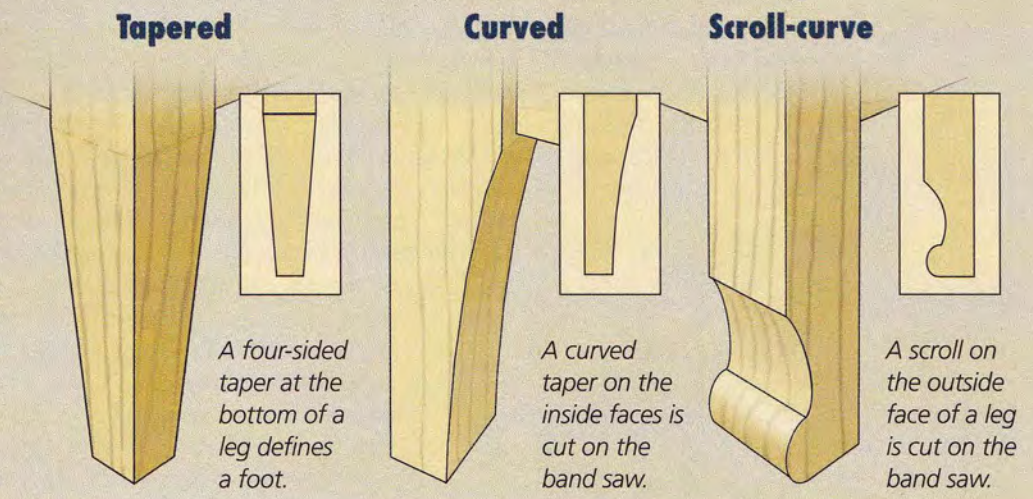
Another way to transform the look of a square leg is by adding a foot. All it takes to create a foot is a few band saw cuts.

TAPER. One way to do this is to cut tapers at the end of the leg (left drawing). Again, leave enough surface to support the leg.

A variation on the taper is shown in the center drawing below. This leg is just arched with a cut on the band saw. The two inside faces of the leg are cut, reflecting a contemporary style.

SCROLL. A scroll shape is usually considered a traditional style. And you may think that scrolls are difficult to create. But a simple scroll on the front of a leg can be cut on the band saw with ease (right drawing).

The legs shown here are just a few examples of a number of profiles you can make to dress up a square leg. You can add or subtract design elements to any size square leg to match the style that best suits your project. W



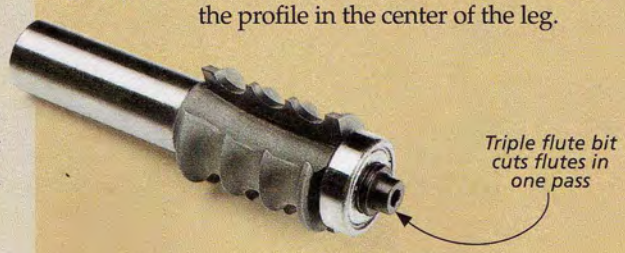
A four-sided taper at the bottom of a leg defines a foot.

A curved taper on the inside faces is cut on the band saw.

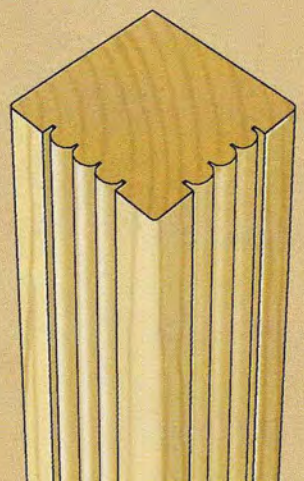
A scroll on the outside face of a leg is cut on the band saw.

Worth A Look: Triple Bead Bit

A triple bead bit, like the one shown below, can be set to cut a profile on the outside faces of a leg in one pass on the router table. Using a bit like this can save time in set up and cutting. To make the profile shown on the leg at right, I set the bit to cut the profile in the center of the leg.



Triple flute bit cuts flutes in one pass



Questions & Answers

Spiral Cutterheads

Q ***I hear a lot lately about spiral cutterheads for jointers and planers. Are they really worth the money?***

Wilbur Orsdale
Mesa, Arizona

A Most jointers and planers have cutterheads with three or four straight knives. As the cutterhead spins, each knife takes a small "bite" out of the wood. This chipping action often results in tell-tale ripples on the surface of the wood.

And more importantly, on wood with difficult grain, you can experience some nasty tearout (drawing at right).

Spiral cutterheads are just that — they have knives that are spiraled in length. Rather than taking bites out of the wood, spiral cutterheads make a skewed, shearing cut. This shearing action results in less tearout, particularly on highly figured woods or boards with unruly grain.

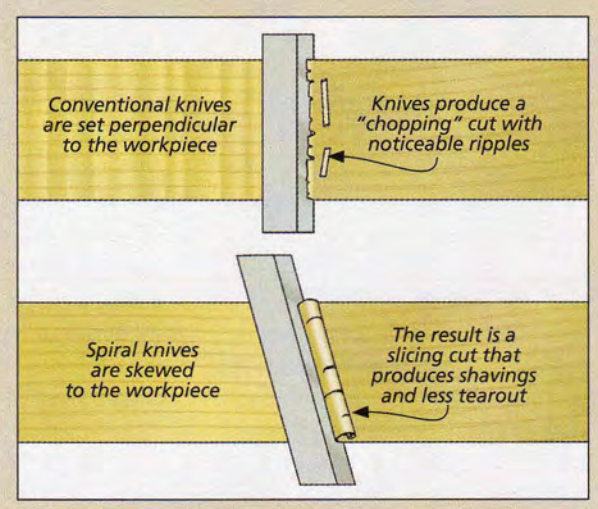
TWO STYLES. There are a couple different styles of spiral cutterheads. One has flexible, high-speed steel (HSS) knives fitted into spiral grooves milled in the cutterhead (upper margin photo).

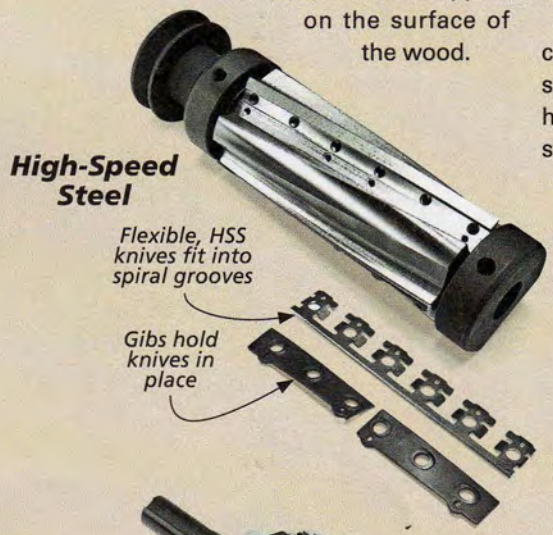
CARBIDE INSERTS. The second type of spiral cutterhead uses a series of square, individual carbide inserts arranged in either a V-shaped or spiral pattern (lower margin photo).

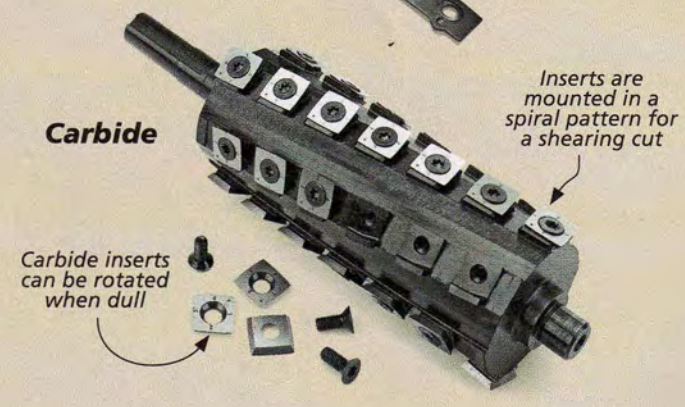
This type of spiral cutterhead has a couple of additional advantages. The replaceable carbide inserts hold an edge much longer than HSS blades. And since each one has four, separate cutting edges, all you have to do is rotate each insert 90° when you notice the cutters getting dull or chipped.

COST. You can purchase spiral cutterheads to fit most jointers and planers. A HSS spiral cutterhead for a 6" jointer runs around $150, while a carbide version is $350.

At that price, spiral cutterheads aren't for everyone. But if you work with a lot of figured woods, the investment may well be worth it. W







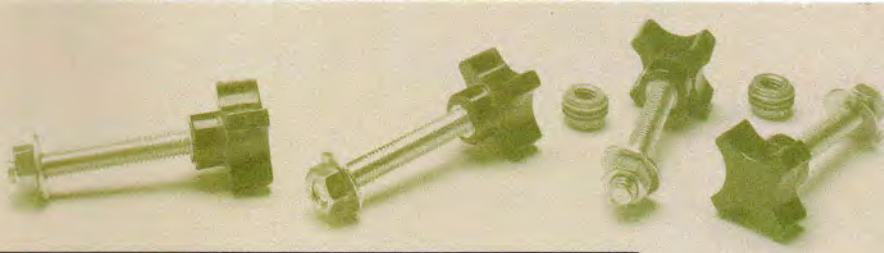
Do you have any questions for us?

If you have a question related to woodworking techniques, tools, finishing, hardware, or accessories, we'd like to hear from you.

Just write down your question and mail it to us: Woodsmith Q&A, 2200 Grand Avenue, Des Moines, Iowa 50312. Or you can email us the question at: woodsmith@woodsmith.com.

Please include your full name, address, and daytime telephone number in case we have questions.

Sources



DUST COLLECTION

Many of the dust collection accessories on page 10 are available from a several different vendors. But a few of the items are sold only through one source. The *Dust Right System* (36134) is available from *Rockler*. We purchased the cyclone lid (05J30.01) and magnetic dust chute (05J21.10) from *Lee Valley*. And *Woodworker's Supply* carries the *Fazlok Universal Connectors* (137-393).

WALL SHELVES

The only hardware you'll need to build the hanging wall shelves on page 16 are the brackets that attach them to the wall. We used a mounting bracket from *HangMan Products* (CBH-18). The 18"-long, two-piece aluminum bracket is rated to support 200 lbs. And it inlcudes a small bubble vial to help you level the bracket when mounting it on the wall.

I stained the shelves with *General Finishes' Gel Stain* (Java) stain. The Craftsman version of the shelf shown on page 19 was stained with *Varathane* Early American. And the shelf with the beaded front was stained with *Varathane* Cabernet. And to rout the profile on the beaded shelf, I used a triple beading bit by *Amana* (54213).

SNACK TRAY CABINET

To build the snack tray cabinet on page 20, you'll need a few items. To start with, the turned feet were purchased from *Classic Designs by Matthew Burak* (463-BF.CH). The brass knobs (02W32.25) and roto hinges (00S01.05) were purchased from *Lee Valley*. And *Rockler* carries the plastic stem bumpers (28373).

To create the profile on the drawer and tray fronts, I used an *Amana* 5/32"-rad. Roman ogee bit (49202). And to give the project the look of aged cherry, I combined two stains — one part *Varathane* Traditional Cherry and one part *Varathane* Cabernet.

MEDIA CENTER

The media center requires several hardware items. Most of the brass hardware was purchased from *Horton Brasses*. This includes the oval knobs (K-40), pantry latches (SL-6), H-hinges (HH-2), bin pulls (BN-2), shelf pegs (SP-10), and shelf peg sleeves (SP-20).

The drawer slides can be purchased at *Rockler* (89690) or through most other woodworking catalogs. Lee Valley carries the rare-earth magnets (99K31.03), steel cups (99K32.55), and washers (99K32.63).

You should be able to find the connector bolts, T-nuts, and screws at many hardware stores. But if you have trouble locating the correct length of connector bolts, *Woodworker's Supply* carries a good selection.

A local glass shop should be able to provide you with the 1"-wide beveled glass for the doors. Lastly, the xenon lights came from *Rockler*. You'll need a two-light kit (39676) for the side cabinets and a three-light kit (39721) for the bridge cabinet.

The stain applied to the media center was a blend of three parts *Zar* cherry stain and one part of *Wood Kote Jel'd* cherry stain.

RESIN FINISHES

Two-part resin (epoxy) finishes are commonly available from many woodworking supply catalogs or craft stores. We purchased the finish from the *Woodsmith Store*. W

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MAIL ORDER SOURCES

Project supplies may be ordered from the following companies:

Woodsmith Store
800-444-7527
Amana Router Bits, Drawer Slides, Dust Collection Accessories, Resin Finish

Amazon
Amazon.com
Cabinet Mounting Brackets

Classic Designs by Matthew Burak
800-843-7405
tablelegs.com
Bun Feet

Hangman Products
818-610-0487
hangmanproducts.com
Cabinet Mounting Brackets

Horton Brasses
800-754-9127
horton-brasses.com
Bin Pulls, H-Hinges, Oval Knobs, Pantry Latches, Shelf Pegs, Shelf Peg Sleeves

Lee Valley
800-871-8158
leevalley.com
Brass Knobs, Cyclone Lid, Magnetic Dust Chute, Rare-Earth Magnets, Resin Finish, Roto Hinges

Rockler
800-279-4441
rockler.com
Drawer Slides, Dust Right System, Resin Finish, Stem Bumpers, Xenon Lights

Woodcraft
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woodcraft.com
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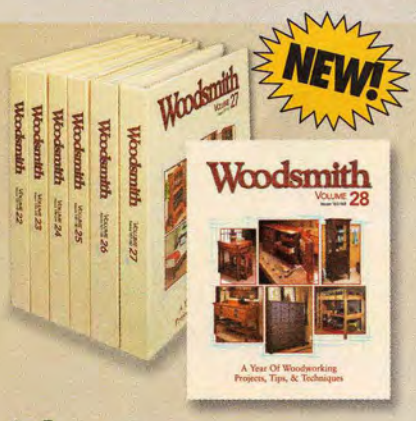

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looking inside
Final Details

► *Snack Tray Cabinet.* This project provides two interesting woodworking challenges in one package. The four lower "drawers" in this stylish cabinet fold out into handy snack trays. We'll give you all the details on page 20.

▲ *Wall Shelves.* The flexible design of this project offers a very practical, space-saving storage solution. Build the individual shelves that suit your needs and hang them anywhere you have a little unused wall space. Turn to page 16 to get started.

► *Media Center.* This beautifully detailed media center will hold all of your electronic gear in classic style — with room to spare. Or, if your needs (and space) are more limited, you can scale down the project by building just the center base unit. The easy-to-follow plans begin on page 30.